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AN ARCHAEOLOGICAL TOUR IN THE ANCIENT PERSIS:

A lecture delivered at the Annual Meeting of the British School in 'Iraq on 12 December 1934 by

SIR AUREL STEIN

IT was a welcome privilege for me to have an opportunity of giving the British School of Archaeology in 'Iraq a verbal account (of which this paper is the substance) of my recent archaeological tour in that great Persian Province of Fars, which has played so notable a part in the history of Iran, and given its name to the whole of Persia. I owed this privilege to the generous help which the School extended to me quite unexpectedly at the very start of my journey. I had planned it as the direct continuation of a succession of previous expeditions which had carried me since the year 1927 from the Indian North-West Frontier first through British Baluchistan and Makran to the shore of the Arabian Sea, and subsequently since 1932 through Persian Baluchistan and along the coast of the Persian Gulf. Those four previous expeditions to which I refer had for their chief object to search those wide and little-known areas once comprised in ancient Gedrosia for such remains of prehistoric settlements as might help to throw light on the relation between the civilization of chalcolithic times revealed by recent excavations at Mohenjo-daro and elsewhere in the Indus Valley on the one hand, and the earliest cultures known to us from Mesopotamia on the other.

Those previous explorations had been carried on by me first on behalf of the Indian Government up to the south-eastern border of Persia. Then later on they were continued into Persian Baluchistan and by the forbidding coast of the Persian Gulf under the auspices of Harvard University and the British Museum. When subsequently I applied in the summer of 1933 to the Persian Government for permission to extend these researches northward into the Province of Fars, I did so with the knowledge that this extension would have to be financed by myself. The special interest attaching to this area of inner Persia seemed to justify this sacrifice. All the same it was with a feeling of gratified surprise that on landing at Bushire I learned that the British School in 'Iraq was prepared to consider a contribution towards the expenses of

this tour. It was a very auspicious welcome on my return to Persian ground, and, of course, I could not fail to accept this kind offer very gratefully.

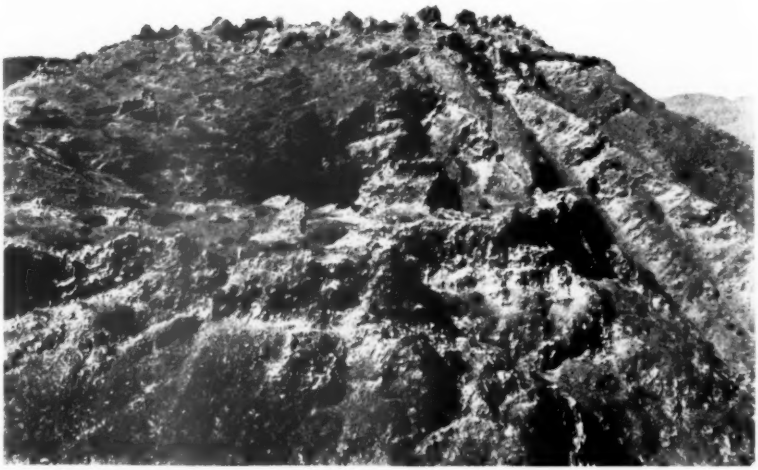
My preceding application to the Persian Government for permission to make these archaeological reconnaissances had been supported by Sir Reginald Hoare, our Minister at Tehran. When this permission was generously granted by His Iranian Majesty's Government, I felt encouraged to hope that, as on my previous journeys, all needful facilities would be forthcoming, and this, thanks to the enlightened spirit prevailing at Tehran, soon proved to be the case. On arriving at Shiraz early in November of last year, I was joined there by Mirza Azizullah Khan Kazimi, an Inspector of Antiquities, who had been deputed to accompany me. Throughout my journeys this cultured Persian official proved a very useful assistant in dealing with the local authorities, and also otherwise a very helpful and willing companion. For the needful escort the orders of the General Commanding in Fars were required, and his absence on tour caused some delay. But in the end this escort materialized in the shape of a dozen hardy gendarmes ever ready to face hardships. Meanwhile I was able to secure the kind personal interest of His Excellency Mirza Ja'far Khan Ahi, the Governor-General of Fars. I owed it largely to this enlightened high official that subsequently all local help was assured to me within his province.

My halt at Shiraz enabled me to arrange needful transport in the shape of a dozen and a half of hardy Shirazi mules, essential for the rough journey before us. Already in 1915 I had learned to appreciate the excellent qualities of these animals when travelling during the war along the Perso-Afghan border to Sistan. Ever since I had looked out for a chance of travelling with those plucky muleteers from Shiraz who know so well how to look after their animals. My expectations as regards these transport arrangements were fully justified. In the course of my tour, which covered aggregate marching distances of some 1300 miles, I never experienced the least trouble on their account, however bad the stony tracks were or however difficult to secure adequate fodder. Nor was a single mule ever found to suffer from serious sores.

Even more important it was for me to be favoured by good fortune in the person of my single assistant, Surveyor Muhammad Ayub Khan. The services of this excellent Indian companion had been lent to me by the Survey of India for the exact topographical survey I was anxious to carry with the plane-table along our routes. Many years of exploration had shown me how important such a route survey was for the proper record of geographical facts bearing on the history and antiquities of the ground. In addition to this mapping and the making of plans of ancient sites my indefatigable Pathan companion gave ever efficient help in all practical tasks connected with excavations, camp arrangements, etc.

Apart from the great Achaemenian sites of Persepolis and Pasargadæ, situated along the ancient highroad which the great 'Kings of Kings' used to follow in their annual migrations, most of the *Persis*, as the Greeks called the present province of Fars, had archaeologically remained so far more or less unexplored ground. It was just this fact, of course, which made it particularly attractive to me, and it necessarily obliged me to include within the

1. Back of domed hall, palace below Tang-ab gorge, Firuzabad



2. Citadel of Qala-i-Gabri

3. Ruined Sasanian palace, Sarvistan, seen from north

4. Mound of Tal-i-Zohak, Fasa, seen from north-west

5. Mound known as 'Castle of Bahram,' Dehbid

scope of my survey whatever ancient remains I might be able to trace. But the object primarily to be kept in view was the search for sites of prehistoric settlement in this area. Considering the prevailing aridity of most of this ground, I could reasonably expect to find such prehistoric settlements marked by mounds which, on their very surface, would show characteristic relics in the shape of potsherds of ancient type, worked stones, and the like. Of course it was important to test such surface indications by trial excavations. But there would not be time to settle down for weeks or months at any particular site.

When I started from Shiraz on November 21 my first goal was the valley of Firuzabad (see map, p. 568). There in a basin enclosed by utterly barren hill ranges is to be found a comparatively well-watered area which all through historical times must have claimed economic importance. The large ruined circumvallation in its centre was known in early Muhammadan times as the City of Gur. But far older occupation is attested by much-decayed ruins which had been noted already by old Muhammadan travellers. A massive tower-like structure rising to more than 100 feet may well have been intended for a high Zoroastrian fire altar as mentioned by early Arab geographers. The massive remains of a structure close by, built with huge carved slabs, are likely to date from Achaemenian times. But since they have been used as a quarry all through the Muhammadan period it would need prolonged excavation correctly to determine its original purpose.

Better preserved and far more instructive proved to be the remains of a great palace built near the mouth of the Tang-ab gorge through which the Firuzabad tract receives its water. The three large domed halls which form the most striking feature of the palace, show characteristics recalling Sasanian architecture. They are adjoined by extensive quarters which must have served for the great following of a ruler. The whole structure is built with rough stones set in hard mortar, just like the famous Sasanian palace of Ktesiphon near Baghdad. It is the solidity of this construction which accounts for the survival under the high vaulted domes of stucco decoration that unmistakably displays the influence of Greco-Egyptian ornamental style. Other great chambers have been badly injured, evidently by earthquakes. There can be little doubt that the whole of this great residence was constructed by a powerful ruler, and the local tradition which ascribes it to Ardeshir, the founder of the Sasanian dynasty, may well prove correct.

Some distance up the gorge a perpendicular rock wall bears the colossal figures of a relievo sculpture obviously commemorating the signal victory of Shapur I over the Roman Emperor Valerian. Similar memorials of that great event are found at other points of Fars, but this one in artistic execution is certainly the most striking among them. Unfortunately the rocky ledge below the relievo is difficult of access, and so narrow that without elaborate preparations no satisfactory photograph could be secured of the whole. I had to be content with studying the characteristic details of the dress and armour worn by the Persian warriors and their foes and of the former's richly caparisoned mounts.

Proceeding up the tortuous gorge I had the satisfaction to survey a remarkable hill stronghold known as the 'Castle of the Princess', commanding the

route. As far as I then knew, it had not yet been properly surveyed. At the end of a narrow rocky spur there rises a massive pile containing a comparatively well-preserved domed hall, and in front of it a great vaulted apartment that must have served as an audience chamber. Lower down there are to be seen the ruins of massively built quarters enclosing a court and clearly intended for defence. Here too all architectural features closely agree with the type of palace as represented by the residence at the mouth of the gorge. Considering the size and position of the castle its construction can be ascribed only to a powerful chief such as the local family of Sasan produced before and since the time of Ardeshir.

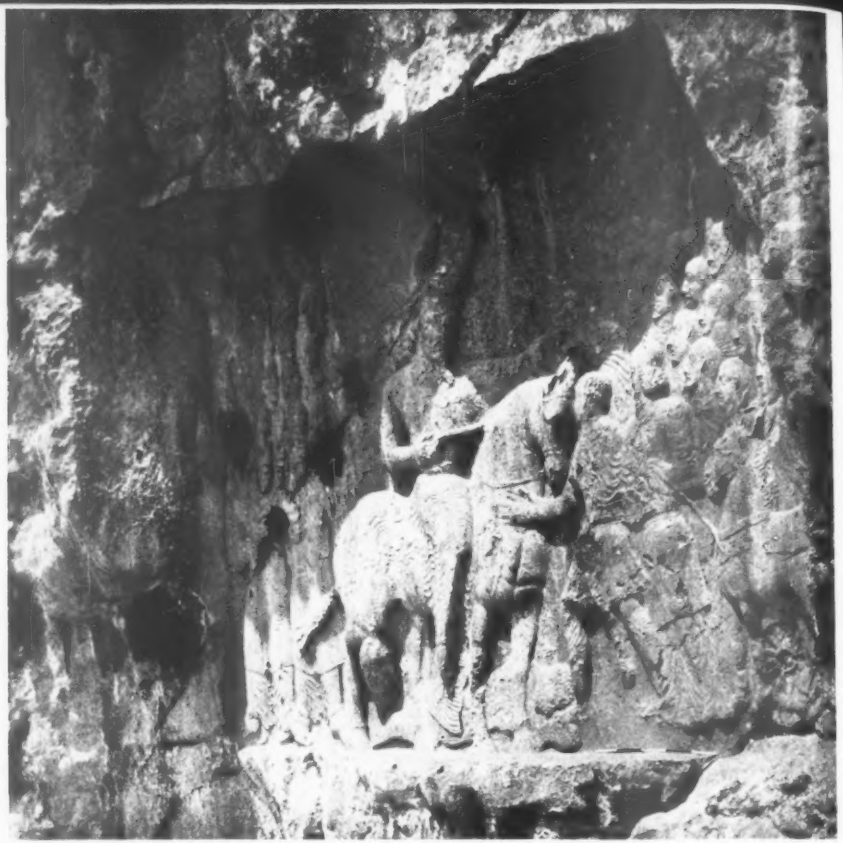
The search parties sent out meanwhile from the oasis failed to produce any relics of prehistoric occupation. But when proceeding myself across the level plain towards the western limits of the cultivable area, my eye was caught by a great swelling that obviously could not be a natural formation. On ascending it I soon had gratifying confirmation that this great mound marked a prehistoric settlement. Already the first rapid search of the surface produced plentiful fragments of painted pottery of a type unmistakably pointing to chalcolithic origin. So no time was lost in moving our camp to the nearest small hamlet. Sparse as is the present population of the oasis, it was not difficult to secure rapidly an adequate number of diggers. The trial trenches carried across one side of the mound produced plenty of ceramic remains closely resembling in shapes and designs the chalcolithic pottery recovered before far away in Persian Baluchistan. Their decorative style recalled also the ware known through Professor Herzfeld's important explorations at a prehistoric village near Persepolis. Small flint implements such as blades, borers, etc., together with stone hammers and querns were plentifully mixed with the painted pottery and settled beyond all doubt the early date of occupation. Particularly interesting finds were some seal buttons engraved with geometrical designs, such as have been found also at early chalcolithic sites close to the Indus. Equally significant it was to come upon a well-constructed drain built with large but poorly burnt bricks. This agreed exactly with the similar provision of drains which I had traced far away in British Baluchistan at sites of the same period. Judging from the size of the mound, which measures about a mile in circumference, it could be safely inferred that cultivation had been carried on around, probably to a greater extent than is to be found now anywhere about Firuzabad.

It had been my intention to move from Firuzabad as far as possible to the south-east in order to reach the low-lying valleys of Laristan while the cold of the winter lasted. The route which we followed with this object in view led across high rugged hill ranges which had never been properly surveyed. The first was crossed by the side of a remarkable cañon which the tradition of the rare cultivators of the adjacent valleys was prepared to ascribe to the superhuman power of the great King Ardeshir. Obviously fantastic as such a belief is, it yet reflected clearly the impression left in the popular Persian mind by the greatness of the Sasanian dynasty.

Like its still greater predecessor, the Achaemenian dynasty, the royal family of Sasan had its original home in Fars. It was curious to be reminded of the way in which it is likely to have first risen to power, when that succession

6. Reservoirs built along cliffs above ruined 'Town of Ij'

7. Ruined barrage on hilltop above ruined 'Town of Ij'



8. *Colossal rock sculpture representing victory of Shapur I over the Emperor Valerian, Nakhsh-i-Rustam, Darab*

9. *Spring-fed pool below rock sculpture, Nakhsh-i-Rustam, Darab*

of trying marches towards Jahrum took us along a route that had regularly been followed by the last Ilkhani of the great confederation of the Qashqai tribes, ill-fated Saulat-ud-dauleh. For many years this powerful tribal chief dominated the troubled politics of Fars, before the present Shah established his control over the whole of Persia and by crushing tribal disorder assured peace.

Saulat-ud-dauleh had been accustomed year by year to share the seasonal moves of his semi-nomadic people. The large forts erected by him to shelter his and his armed host's chief halting-places on these annual migrations are now, along with the residences inside, rapidly falling into ruin. On examining in the tract of Qir the great mound on which one of these fortified palaces, the Qal'a-i-Parian, is built it was interesting to note that it had been heaped up on or around a chalcolithic site. Stretches of ground in the valleys apparently cultivated within the historical period but for a long time past abandoned to nomadic grazing were passed again and again. Here as elsewhere there was striking evidence to be seen of the far-advanced decay which settled life has undergone in these parts, even on less arid ground, during historical times. But nowhere in Fars did I notice any definite proof pointing to 'desiccation,' *i.e.* climatic change, having played a part in this process, as it obviously has in Makran.

At the flourishing oasis of Jahrum, which was next reached, irrigation proved to be wholly dependent on Qanats or underground canals tapping subsoil drainage. No prehistoric remains could be traced there. This negative observation had its antiquarian interest. It fully confirmed the conclusion arrived at during my previous explorations in Baluchistan that the Qanat system of irrigation widely prevailing nowadays throughout Persia on ground lacking adequate water on the surface dates only from historical times, as distinctly indicated in fact by an interesting notice of Polybius.

At Jahrum I learned that official apprehensions entertained at headquarters precluded the planned move to the south-east into Laristan. So after a brief halt which enabled me to examine two small strongholds, perched on very steep rocky ridges and probably dating from early Muhammadan times, we first turned north-westwards into the Khafr valley. Through it led a once much-frequented trade route from Shiraz to the mouth of the Persian Gulf. Guided by a brief reference of Chardin, who had followed it in the late seventeenth century, I was able to examine there, among other remains, interesting ruins of pre-Muhammadan places of refuge built under overhanging cliffs in the cañon cut by the Kara-aghach river. Crossing thence a previously unsurveyed hill range to the east we reached by the close of December the wide valley of Fasa. There abundant scope opened for fruitful archaeological work.

Within a large circumvallated site there rises steeply the conspicuous high mound of Tal-i-Zohak (Fig. 4), bearing ruined walls on its top. Trial excavation proved it to have been artificially raised at a late prehistoric period. The surrounding town site was shown by finds, among them an interesting small Hellenistic sculpture, the head of an Aphrodite, to have been probably occupied from Parthian down to mediaeval times. A great harvest is likely to await here future students who could afford a season or more for extensive excavations.

On the rugged hill chain overlooking the Fasa valley from the west there

was surveyed a remarkable ruined stronghold known as Qal'a-i-gabri (Fig. 2), extending its solidly built defences over a circuit of more than 3 miles. From the ceramic and other remains recovered in vaulted quarters of the citadel, and from the style of the stucco decoration surviving in places on their walls, it may be concluded that this 'Fort of the Zoroastrians,' as it is called, dates from Sasanian times. The construction of so extensive a place of refuge presupposes a far greater population than the present resources of Fasa could support.

In the same direction points the discovery of half a dozen prehistoric mounds, some of considerable size, in the lower portion of the valley. This nowadays receives but scanty irrigation from surface canals fed by a small stream. The painted ceramic ware and stone implements recovered by trial excavations at these sites definitely indicate occupation in chalcolithic times. That this continued over a long period was clearly proved at one of the large mounds near the village of Fidishkuh. There trial trenches carried in parts to a depth of fully 18 feet from the surface disclosed in all layers the identical type of a superior painted pottery, distinguished by its fine fabric and dark red colour. Worked flints abounded throughout.

In the wide plain lower down, waterless except for a few neglected underground canals, no marks of prehistoric settlement could be found. But in an utterly barren side valley to the east an interesting burial ground dating from Sasanian times was explored. It comprised numerous cairns, similar in type to those examined by me before at different places of Makran, but of far more elaborate construction. They contained remains from bodies previously exposed to birds and beasts, along with funerary deposits. The objects of personal use, trinkets, etc., found among these acquire additional interest from the fact that in one of the large cairns, built as a kind of family crypt, a well-preserved Sasanian silver coin deposited with such objects afforded definite chronological evidence.

The subsequent move northward took us to the foot of the high Tudej range, snow-covered at the time. Apart from some minor chalcolithic sites in the valleys there were several ruined mountain fastnesses to be surveyed on adjacent hill spurs. One of them is known as the 'prison of Isfendiar' from an epic legend of Firdausi's Shahnamah being localized here. When we had climbed not without difficulty the top of the isolated hill, girt all round by almost vertical cliffs, we found there a series of large rock-cut tanks intended to hold water, the indispensable provision for all these ancient places of refuge. Another mountain fastness of this type, visited near Istahbanat farther to the north, is seen in Fig. 12.

But far more interesting were the extensive ruins of the 'town of Ij,' abandoned since the Mongol invasion. It was built on a plateau which a deep ravine on one side and very steep rocky heights on the other provide with natural defences of great strength. An impressive feature was the series of great rock-cut tanks and the large cluster of ingeniously built reservoirs (Fig. 6), clinging like huge swallows' nests to precipitous cliffs, hundreds of feet above the valley. They were meant to assure a safe storage of water brought by a carefully constructed aqueduct from the single available spring high up in a gorge above the defended site.

10. Rock-cut mosque in gorge below ruined 'Town of Ij'

11. Rock-cut hall in 'Palace of the Princess,' Darab

12. Mountain fastness, 'Castle of the Princess,' above Istahbanat

13. Ancient rock-cut road along cliffs in Bulaki gorge below Pasargadae

Equally striking was the labour bestowed upon the construction of a succession of massive barrages (Fig. 7.) meant to hold up rain-water in a ravine on the top of a rugged hilltop and thus to guard against the risk of the supply from that single distant spring failing. A hall carved into the solid rock (Fig. 10) and used as a place of prayer is found in a gorge deep below the fortified hillside where water from the same spring reappears amidst a confusion of big boulders. If the rock-cut hall did not date from Islamic times it might well be taken as having served for the worship of that life-giving water amidst these utterly arid hills.

After crossing the watershed range towards the Niriz basin and passing through the better-cultivated tract of Istahbanat the head of the Sarvistan valley was reached. There the massive ruins of a Sasanian palace (Fig. 3), noticed by previous European travellers, provided an interesting object of study. The domed audience hall, the smaller council hall, the private chambers of the ruler and the vaulted galleries by which the retinue had access to the State rooms could all be clearly determined. Trial excavations not far off at three small mounds of prehistoric origin furnished valuable stratigraphic evidence. For here the debris from chalcolithic settlements was found to overlie remains manifestly neolithic resting on virgin soil. Interesting, too, was the monolith undoubtedly once serving for a Zoroastrian fire altar to be seen near a large spring close to the ruins of an ancient *chiusa*, guarding the route from Istahbanat to Sarvistan and Fasa.

While engaged at Sarvistan I received news of the eagerly awaited permission to extend my tour as originally planned to the district of Darab in the south-east. It was reached by six marches partly over unexplored mountainous ground and proved, as expected, rich in antiquarian interest. In the western portion of this wide tract three considerable mounds near the small village of Madavan yielded on trial excavation plenty of painted ceramic ware besides other relics of chalcolithic civilization. Designs on the pottery representing horned sheep and other beasts curiously recalled the painted ware of Susa. One of these mounds, known as Tal-i-skau, might from its great size be well described as a town site. Two more mounds of the same early period, also extensive and yielding similar painted pottery, were subsequently investigated near Khusu, on the route leading south towards Lar. Access to the latter area remained, however, still barred.

In the central and comparatively well-watered portion of the Darab district circular ramparts, still imposing in their decay and adjoined by a great fosse, guard the site of Darabgird, measuring fully a mile in diameter. Surface remains within clearly proved occupation extending from late pre-Muhammadan to mediaeval times. The view from a rocky hill in the centre indicated a systematic lay-out of the town.

Where a fine spring issues at the foot of low and utterly barren hills to the north, a large many-figured rock sculpture (Fig. 8), known as Nakhsh-i-Rustam, and situated above a fine spring-fed pool (Fig. 9), commemorates the victory of the great Sasanian ruler Shapur I over the Emperor Valerian. Since it was visited and roughly sketched in 1812 by Sir William Ouseley it does not appear to have ever been adequately reproduced. In composition, if not in style, this impressive and well-preserved rock carving differs from other representations of the same scene.

Equally interesting proved the examination of a remarkable hall, carved into solid rock and variously known as 'the Stone Mosque' or as the 'Palace of the Princess' (Fig. 11). The cruciform plan of the excavated hall seemed hard to reconcile with a place intended for Muhammadan worship.[1] It rather suggested the influence of Early Christian church architecture as practised in the Near East. Certain details of architectural features make it certain that this rock-cut hall, whatever its original purpose, dates from early Islamic times. An Arabic inscription records the date of A.H. 652, corresponding to A.D. 1254.

After completing this survey in the Darab region I moved early in April north-westwards into the large Niriz basin. The as yet little-known high hills and plateaux crossed on the way were still bitterly cold and bare in April, but during the summer months afford grazing to nomadic Arab tribes. As the patches of cultivation to be found around the salt lake-bed of Niriz depend wholly on irrigation from underground canals, there was nothing surprising in the fact that what scanty remains of earlier settlements could be traced here all dated from historical times. Nor was the long journey which took me from Niriz to the northernmost parts of Fars likely to lead past many traces of prehistoric settled life. For the high ranges and elevated valleys there crossed have always been destined by their very nature to serve mainly as summer grazing grounds for such nomadic tribes as the present Qashqai Turks and Khamseh Arabs.

But once the long-stretched Bavanat tract was reached relics of chalcolithic settlements in the shape of painted pottery, etc., cropped out again; also lower down in the valley coarse hand-made ware and worked flints, perhaps of a still earlier period. Then where farther west we struck the ancient highroad which connects Shiraz with Isfahan and other chief places of central Persia, interesting work awaited us. Near the village of Dehbid there rises a conspicuous high mound suggesting with its almost vertical sides the walls of a ruined fort (Fig. 5). It is known as the 'Castle of Bahram.' The mound owes its height to prolonged occupation through the ages and its curious appearance to subsequent digging down for manuring earth as continued by neighbouring villagers down to the present day. Fortunately these operations had left the lowest layers undisturbed and easier of access than they might have proved otherwise. So systematic clearing of this debris brought to light here plenty of painted pottery fragments, often of superior type, and other interesting relics of chalcolithic civilization.

The concluding portion of the tour carried me south along the line of the same ancient highway to the famous great sites of the Achaemenian Empire, Pasargadæ and Persepolis. In the vicinity of the former, by the bank of the Pulvar river and within view of the tomb of Cyrus, impressive in its simple grandeur, the interesting small site of Dotulan was explored. Chalcolithic remains proved to be overlain by debris of structures probably belonging to the early historical period. Where the river a short distance below passes through the narrow defile of Bulaki, I could study another striking monument of Achaemenian greatness. It is a carefully executed gallery cut into hard rock walls and carried for a considerable distance along the face of high and

[1] As shown by the rock-carved prayer niche.

precipitous cliffs (Fig. 13). It was meant to provide a convenient passage for the 'Kings of Kings' on their seasonal moves between the two royal seats. It was a strange feeling to be able to touch with my hands the very stones over which Alexander, too, must have passed on his way back from his Indian campaign and the disastrous march through Gedrosia.

At several points lower down that historical highway definite indications of prehistoric settlements could be traced before we arrived by the middle of May at the ruins of Persepolis. There amidst the most imposing monuments of Persian greatness upon which Professor Herzfeld's devoted efforts are now throwing the full light of exact archaeological research with most impressive results, my tour in the ancient Persis appropriately came to its end.

The laying out at the British Museum of what official parlance would call the "archaeological proceeds" is now being carried on by competent hands under the direction of my old friend and ever helpful collaborator, Mr. F. H. Andrews. I must consider myself very fortunate in having been able to secure his help once more as after all my Central Asian expeditions. Their proper examination and study is likely to take more time than I can afford at present, when the full account of my preceding explorations on Persian ground still awaits completion. But I hope that during the next summer the peaceful alpine isolation of a beloved Kashmir mountain-top which for many years past has often seen me engaged on such labours, will enable me to dispose of this task also.

And then perhaps I may be once more free for fresh exploratory labours in the field. If Fate is kind and those who dispense it for Iran show favour, I may then perhaps secure the chance of extending my reconnaissances over ground that lies nearer to 'Iraq and has been more closely linked with its ancient civilizations. But however that may be, I shall always remember with pride that the latest of my antiquarian tours was associated with the memorial of that great explorer, scholar, and lady whom we all admire and honour in Miss Gertrude Bell.

BOULDER DAM AND ITS GEOGRAPHICAL SETTING:

An expansion of part of the lecture on "Floods and Flood-Control in China and America" delivered at the Evening Meeting of the Society on 29 April 1935 by

GEORGE B. BARBOUR

WHEN a handful of men undertake to dam back a body of water large enough to supply 5000 gallons to every member of the human race, it ceases to be merely an engineering feat and becomes a geographical fact of far-reaching importance.

The Colorado River, like the Hwangho, owes its name to the caramel colour of its silt-laden waters. Like the Hwangho also, it drains a large inland basin between latitudes 33° and 43° N., draws its headwaters from a high mountainous area in the heart of the continent, crosses a semi-arid region of varied geological structure and breaks loose across a low-lying terrain where its uncontrolled ravages are a menace to life and property, before finally entering an epicontinental embayment of the Pacific.

Boulder Dam itself is only one, though the most important one, of a series of related projects for the regulation of the Colorado. These form part of a comprehensive federal scheme embracing four aspects—flood control, water supply and irrigation, power development, and inland navigation. In the Boulder Canyon Project, as it is termed, the last aspect plays no part. As to the scale on which the others are involved it is enough at this point to note that the reservoir will hold two years' entire flow of the river, amounting to 30,500,000 acre-feet (10,000,000,000,000 gallons), will water 3000 square miles of irrigable land, and will supply power to a generating plant with a capacity of 1,835,000 h.p.—two and a half times that of Dnieprostroi or four times that of the American plant at Niagara—adequate to meet, say, one quarter of the entire demand of the United Kingdom in 1933. The catchment basin served by the Colorado and its tributaries is outlined by the solid line in the map. Of the seven states which have an interest in the basin only the three western ones—Arizona, Nevada, and California—benefit directly by the present scheme.

Between the Rocky Mountains and the Gulf of California the river crosses a region of varied geological make-up. Rising in an uparched area of folded strata and intrusive granite, it flows over an expanse of simpler, slightly tilted and warped, plateau structure. Passing across a zone of huge step-faults it enters the Great Basin, where block-faulting gives the typical basin-and-range topography well shown in Fig. 1.

The Colorado already had a well-defined course before uplift led to its entrenchment. The channel has thus been incised into foundations of unequal resistance, so that the river's attempts to widen its valley meet with very varying success at different points along its course. On leaving its strictly confined passage through the Grand Canyon, the Colorado crosses an area where it alternately enters gorges cut in tough rock and then passes out into open basins eroded in weak sediments. To impound a sufficient volume of

1. The Las Vegas basin viewed from 3000 feet above Boulder City

Fairchild Aerial Surveys

2. *Black Canyon, the site of Boulder*

the site of Boulder

water with a minimum of masonry and a maximum of security, the obvious course was to plug the base of a gorge section downstream from one of the open basins. Boulder Canyon, from which the river is seen emerging in the left distance of Fig. 2, separates Nevada (left) from Arizona (right) just where the river makes its final turn south to the Gulf of California, and offers just such a site. Preliminary surveys and estimates were made for a dam at this

point. Meanwhile other sites had been investigated and, with one exception, rejected. This single exception was a position in Black Canyon, seen in the foreground of the picture. When the geological and engineering experts restudied in detail the relative merits of the two alternatives, a surprisingly evenly balanced set of advantages and problems was recognized. Neither site was distinctly superior. However when the balance sheet was struck it showed a very slight credit in favour of Black Canyon—the rock foundations were a trifle more reliable, facilities for preparing the immense volume of

concrete needed (3,250,000 cubic yards) were a little greater, certain engineering problems were slightly simplified, and the volume of water impounded by a dam of given specification was a fraction greater. Hence the amusing anomaly that Boulder Canyon Dam has finally risen in Black Canyon.

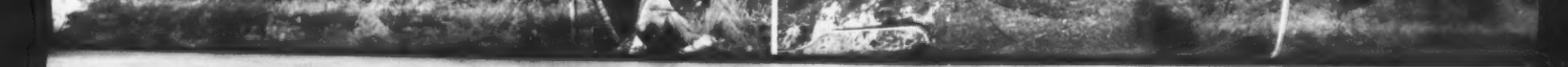
The foreground and much of the rougher distance in Fig. 2 is of tilted layers of andesite breccia, peculiarly suited to the needs of the engineer, as it proved to hold up during tunnelling without timbering, thus letting the blasting gangs advance with unexpected rapidity and complete the excavations months ahead of the scheduled time. The depression in the left middle distance is eroded in a gigantic pocket of lighter-hued gravel and sand—part of a thick blanket of detritus laid down by rivers and rainwash on the rugged, fault-sliced basement of igneous rock in which the canyon itself is cut. The black mesa and talus-slopes of Fortification Hill, the central landmark in the view, are all that remains of younger basalt lava flows which once capped the pale sediments, but which collapsed as the latter were undermined on all sides. Except close to the Colorado itself, the depressions are of much gentler moulding than the picture might lead one to expect. Basins farther from its banks are without surface water except immediately after thunderstorms and are therefore floored with a cover of torrential detritus which buries the base of the ranges to well up on their flanks. This feature is well shown in the first view (Fig. 1) taken from a point only 2 miles farther west, but looking away from the river into Nevada instead of upstream. The size of the basin crossed by the road and railway vanishing into the haze may be judged from the fact that, when they rejoin on reaching the Union Pacific main line at Las Vegas, 20 miles away, the mountains in the left distance are still 10 miles off.

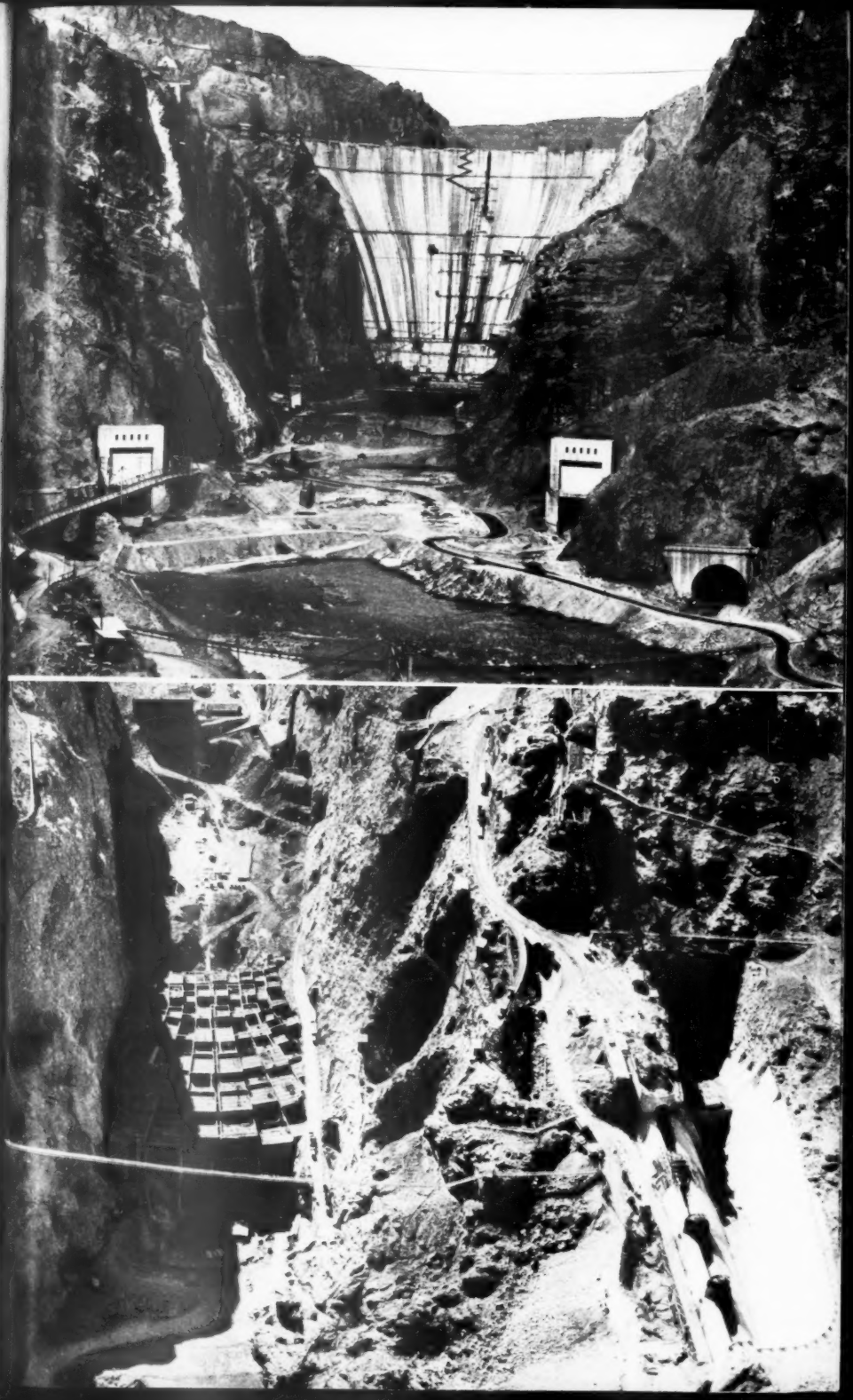
It will be seen from the sketch-map that by damming Black Canyon the run-off from three-quarters of the entire Colorado basin is held in check. The capricious behaviour of the river is shown by the astounding variation in its flow at different seasons. Measurements made at Yuma, Arizona, record a minimum of 66 cubic feet per second and a maximum of 240,000—three thousand six hundred times the minimum discharge. To ensure a steady flow for irrigation and an adequate head for power development, a reservoir covering 227 square miles (the size of the county of Middlesex) will retain two years' average flow of the river, amounting to $3^{1}/_{2}$ million acre-feet. To achieve this an arch-gravity dam, rising 726 feet (five times the height of the Nelson Monument) above the lowest point on bed-rock will raise the water-level 584 feet,[1] thus making Boulder Dam by far the loftiest in the world, the next highest being the Sautet Dam (446 feet) now under construction in France. The magnitude of the operations even seen in a photograph (Fig. 4) lacks the breath-taking impressiveness of which the most hardened of globe-trotters are conscious on first looking down on it. The writer has visited the site four times since work there began, on the most recent occasion (September 1935) flying over the dam and up the entire present length of the reservoir. On the second visit he had the peculiar fortune to have as guide Mr. Walker Young, Construction Engineer in charge of the work at the Boulder City field office.

The dam is 1180 feet in length along the crest, and called for 3,250,000 cubic

[1] Official figures taken from Bureau of Reclamations documents kindly furnished by Commissioner Elwood Mead, Department of Interior, Washington, D.C.

3. Dam and first power unit nearing completion
4. Dam rising in base of canyon
Fairchild Aerial Surveys





5. Black Canyon, Boulder Dam and partially filled reservoir in March 1935

reservoir in
March 1935

yards of concrete, the total used for dam, power plant, and related structures being sufficient to build a pillar 100 feet square, over 2 miles in height. The heat evolved during the setting of the cement is dissipated by artificial cooling. An ammonia refrigerator, capable of freezing 1000 tons of ice per day, furnishes chilled water to 570 miles of steel tubing which is embedded as the concrete is poured.

To erect a monolithic structure of these dimensions in the path of a river like the Colorado has been a triumph of engineering skill. Before the foundations could be laid in the stream bed 139 feet below water-level, the entire flow had, of course, to be diverted out of the canyon. This was done by driving four 50-foot tunnels, 3 miles in aggregate length, into the walls of the gorge just above river-level at points upstream from the dam site. The water could thus outflank the dam on both sides, coming out again farther downstream. Two of the four downstream portals, one dry, the other still flowing, can be seen in the foreground of Fig. 3. When all was ready for the diversion, charges were fired in blast-holes driven in the canyon walls at points between the tunnel portals and the place where the foundations were to be excavated, thus throwing two moles of broken rock and earth across the channel above and below the dam site respectively (Fig. 7). The upper of these two coffer-dams, reinforced with steel piling and concrete, at once raised the water-level, forcing the flow into the tunnels. The lower coffer-dam prevented downstream water from backing up when the actual site was unwatered. The diversion was successfully carried out on 13 November 1932 and the work of emptying the canyon began at once. The site was pumped dry and for the first time there was a chance to judge the accuracy of the predictions of the geologists as to the suitability of the site to carry the foundations for the gigantic structure. Incidentally it was hoped that new light might be thrown on the stream-bed activity of a river of this calibre.

In both respects results surpassed the most sanguine hopes of those responsible for the enterprise. An abstract of the official report on the bed-rock conditions by Professor C. P. Berkey contains the following sentences:

"On the whole, the results of all the later work connected with the structure confirm the essential accuracy of the original statement (1928) of the Colorado River Board with respect to the good quality and the excellent working behaviour of the rock forming the canyon walls, the tight character and favorable behaviour of the river fill, the soundness of the floor of the gorge and the general feasibility of the undertaking so far as geological factors were concerned. If the items covered in the first report of that board were written now, with all of the advantages of subsequent construction experience and full exposure of the site, none of them would require material modifications to fit the actual facts as found. . . . If the floor had been stripped as it is now, before the exact site was selected, it could not have been located more accurately to take advantage of the best local conditions."

Until the rock floor of the canyon was cleared the condition of the sand and gravel deposit filling the river-bed to a depth of 120 feet was a matter of conjecture. There were even fears that the base of the coffer-dams might not be watertight. Trial borings in both Black and Boulder Canyons had shown a

rock bench or terrace projecting from both sides of the gorge beneath the 40–50 feet of gravel lying on the channel bottom. When this rock platform was exposed it proved to have such regularity and sharpness of form that it can have only one meaning, namely that the whole mass of sediment is periodically swept over the canyon bottom, scouring the floor right down to bed-rock and then reburying it at slack water under 50 feet of material. Hence the entire thickness is of recently deposited material. This fact received striking proof when a sawed plank was found reposing directly on bed-rock buried beneath 40 feet of sand and gravel. A second unexpected feature was a narrow tortuous inner canyon cut some 75 feet deeper down the middle of the main rock bench. The walls of this canyon-within-a-canyon are quite irregular and often coarsely fluted vertically. The flutings are the result of extensive pot-hole erosion by boulders moving under the swirling current action at times when the bench itself is scoured by flood water. As the pot-holes are enlarged, partitions between them give way, the holes become confluent, and a winding chasm results. At the lowest point excavated this inner canyon has a width of less than 10 feet (Fig. 8).

Since the reservoir will take two years to fill, the diversion tunnels could be safely plugged once the dam rose well above river-level. The first effect of stopping the outlet was to make the water back up and flood the marginal low ground upstream. Eventually with rising water-level the reservoir will thus reach to a point 115 miles from the dam and extend 35 miles up the Virgin River. An early stage of the flooding is seen in Fig. 5, which should be compared with Fig. 2 taken previously from the same point. As the ponded water backs up, two further physiographic features become prominent. One is the delicately fretted shore-line of the lake with embayments typical of submergence, shown in the superb vertical air-photograph (Fig. 6). This view, from a height of 20,000 feet, covers an area of about 150 square miles, and was taken by the Fairchild Aerial Surveys with a 10-lens apparatus specially built for the U.S. Coastal and Geodetic Survey. Photographs of this kind are to be taken after each 25-foot rise in the water-level.

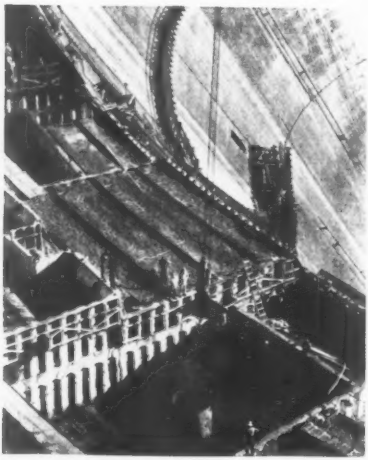
The second feature is the clarifying of the water as the silt is dropped at the head of the reservoir, the water reaching the power plant clear of sediment. The red-brown colour is gone and the smooth expanse has a vivid clear-green brilliance that seems out of place in the semi-desert. Flying up-river at 2000 feet elevation, the change back to normal Colorado colour at the lake-head is surprisingly abrupt except during flood water. Fears have been expressed that the vast quantity of sediment, amounting to 137,000 acre-feet per year, would silt up the lake so soon that its life of usefulness would be short. Actually, at the present rate, less than one-tenth of the volume of the lake will be filled in fifty years.

The sum appropriated by Congress for the dam and reservoir alone was approximately £14,000,000 with a further £7,600,000 for power development. The Boulder Canyon Project also includes the "All-American Canal" just north of the Mexican border from the Lower Colorado to the Imperial and Coachella valleys, for which £7,700,000 is added. Provision for interest payments and the like bring the total to £33,000,000. It is therefore worth seeing what benefits may be expected from this immense outlay.

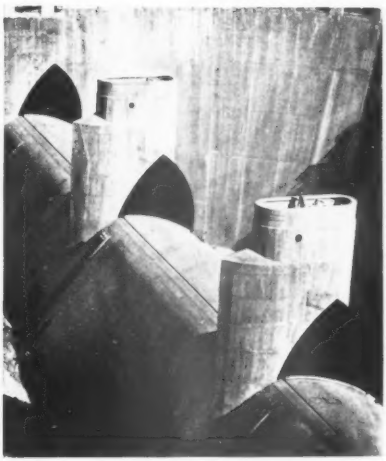
6. Boulder Dam and Lake, phot. by Fairchild ten-lens compound air camera from 20,000 feet

7. Blasting canyon-walls to make coffer-dam

8. Excavating narrow base of inner canyon



9. Pouring concrete sections of dam (compare 4)



10. Overflow spillway (engineer on tower shows scale)

Phot. Bureau of Reclamation

The actual construction gives employment to 3500 men for six years on an average monthly pay roll of £100,000. To house the short-term employees, the permanent staff, their families, and the community supplying their needs, the Six Companies—as the contracting organization is called—have erected Boulder City, the third largest town in Nevada. This is a town-planned settlement on government ground, laid out with the knowledge that, apart from the structures needed for the permanent staff, most of the buildings will be turned to other purposes as the place draws to itself the numbers which its new importance will attract.

The motor road on the crest of the dam is the first link of its kind between Nevada and Arizona, the nearest bridge being at Needles, California, 100 miles downstream and there being no north–south highway between here and the state of Colorado. Thus Boulder Canyon is the first main crossing west of the Rocky Mountains. It is hard to forecast just how extensively the new thoroughfare will affect the internal distribution of products and commodities, but with the highly organized long-haul motor trucking that has developed to avoid the heavy rail-freight charges, it is bound to mean improvement even for this sparsely populated area.

The first power units are already in operation. On completion of the dam in 1937 electrical energy to the amount of 4,330,000,000 kilowatt-hours (one quarter of the total produced in the United Kingdom in 1933) will be available from the fifteen 115,000 h.p., and two smaller, generators. The sale of power over a fifty-year period is calculated to repay the cost of the dam and power plant and all operating expenses, plus interest. The various groups contracting for the use of electricity are building their own transmission lines, power being carried to Los Angeles, 250 miles away, by that city itself. With the new low rates available, this is expected to lead to a varied industrial development for which plans are already under way.

With the river under control and the steady delivery of water assured, ground hitherto useless can be profitably brought under cultivation at a cost not justified without the guarantee of a regular supply. An agreement between the states involved allocates the total amounts which each is entitled to draw off for its own interests, since a large fraction of the water so used never finds its way back to the Colorado. Preliminary surveys show that 2,000,000 acres of irrigable land are distributed among the three states in the proportion Nevada 1, Arizona 53, California 80. The immediate benefit to the coastal state is obvious. The largest single area to profit directly will be Imperial Valley, to which water will be carried by a canal 80 miles in length, thereby doubling the cultivated area of this valuable fruit-ranching district. In 1933 Imperial Valley exported 30,000 van-loads of cantaloups and lettuce, the other chief products being alfalfa, barley, indian corn, dates, figs, and citrus and other fruits.

The All-American Canal is being extended 130 miles to irrigate the Coachella Valley. One of the special problems along the canal is the danger from drifting sand, which is being anchored by planting bent, or by covering with coarse rubble and spraying with crude oil.

With a steady supply of water ensured by the Boulder Canyon Project other independent projects have become matters of practical politics. The

city of Los Angeles has begun work on a 239-mile aqueduct, including 24 miles of siphon construction, to draw off water from Parker Dam 155 miles below Black Canyon. Sanction is awaited for a scheme to irrigate bottom land along the Gila River in Arizona and other similar plans are under consideration.

The magnitude of the whole scheme is somewhat breath-taking. The possible reverberations of its results on the economics of the country are not easy to forecast. Success depends in the first case on the ability of the region to use the power generated and the capacity of the markets to absorb the increased production of food and commodities. While for areas immediately benefited the advantages are obvious, the success of the project itself may lead to serious over-production, and will certainly put competing districts at a disadvantage, perhaps forcing the more struggling communities out of existence. Only by a most carefully supervised control throughout the period of readjustment will it be possible to ensure a gradual accommodation to the changed conditions without deranging the markets and upsetting the delicate balance of interstate trade. But in a poorly watered region, with good soil and a growing season of 365 days in the year, one can hardly blame the inhabitants for taking a keen interest in a river which, if kept under control, promises so much.

THE CLIFF SCENERY OF ENGLAND AND THE PRESERVATION OF ITS AMENITIES[1]

VAUGHAN CORNISH

THE view of the sea from the beach is an unfailing harmony of tone and colour for the water responds instantaneously to the changes in the sky. Ascend the cliff and to these charms is added the inspiring impression of immensity. In this effect two causes cooperate. With the increased elevation of the eye more of the watery plain comes into view, a narrow band indeed but bringing that softness of tone which suggests great distance, an effect which is often enhanced by the close clustering of the yet more distant clouds which come into sight above the delicate line of the horizon.

The impression of immensity in the prospect from the cliff does not however depend wholly upon height but in great measure upon the steeply descending foreground. This is due to the fact that although we detect at once a lateral slant in the view, the human eye is not sensitive to a departure from horizontality in the direction of its outlook. Even when the horizon is upon the same gravitational level as the eye, or only differs from that level by the small angle due to the curvature of the earth, the position of the horizon in the field of vision depends mainly upon the slope of the foreground. When standing upon flat fields of the Fen Country or on Romney Marsh the ground-line 10 degrees below the horizon is within 30 feet of the observer and nothing much nearer than this can be focussed at the same time as the distant view. There is moreover a sort of compulsion upon the sub-conscious mind to reject the idea that the paltry distances within a few steps of our standpoint are a large part of a full-scale landscape. Ten degrees is not nearly the half of our natural field of scenic vision and so in the flat land of fen or marsh the plane of sight habitually inclines upwards, we take into our view much more of the sky than of the land without any warning sensation of the upward slant of the eye, and so we all feel that the sky of the Fen Country is splendidly spacious. This is due to the fact that we look so as to see more, not because there is more to see.

Human stature is puny in comparison with the distance of the horizon given by the great radius of the sphere upon which we live, and so when standing on the fen or beside the sea the terrestrial view is inconveniently foreshortened. In Brobdingnag, as we know from Gulliver's narrative, the stature of a man is ten times as great as in England, but the distance of his horizon is only increased three-fold and the proportions of the terrestrial part of the field of view are better than they are for us. But we have only to take our station on the verge of a lofty cliff and we obtain at once the scenic outlook of a more than Brobdingnagian stature. The watery plain 30 degrees below the gravitational level is now sufficiently far off to be focussed with the horizon, and as viewed from a giddy height the diminished pattern of the waves below appears to be at a considerable distance. From such an elevated level of the eye a super-Brobdingnagian might view the horizon in or near the middle of the picture, but to a mere man suddenly raised to a stature of 200 feet the

[1] Geographical Section, British Association, Norwich Meeting, 6 September 1935.

view below the horizon is the more important part of the picture and the direction of his outlook inclines downwards spontaneously and without any muscular sensation. The sky view is thus diminished, the horizon comes near the top of the field of vision and the watery plain embracing nearly all the field appears vast indeed.

There is no mathematical formula to enable us to evaluate the two factors of height and steepness which contribute to the impression of space in the view from a steep and lofty coast and I have therefore made observations in different places to obtain a standard by which to judge what parts of the English coast are to be included in those cliff lands which provide an impressive prospect of the sea. From a height of about 100 feet on the verge of the steep cliff west of Branksome Chine on the way to Poole Haven the apparent expanse of sea is notably enlarged by the raising of the horizon in the field of vision and there is a sense of formidable depth below On the east of Branksome Chine, that is to say on the Bournemouth side, there is a short reach of cliff of only 50 feet. From this the outlook on the bay and its coast is charming and beautiful, but the prospect of the sea itself is far less impressive than from the 100-foot cliff. From this and confirmatory observations I adopt 100 feet as the least height for the cliff lands which are to be included in our scenic survey.

Next as to the factor of steepness. A perpendicular cliff when viewed in profile is much more impressive than a sloping cliff, but when standing on the summit of an almost perpendicular cliff, as at the end of Berry Head in South Devon, it is not practicable to view the face, and, no recessional plane being seen, much of the visual effect of the gravitational descent is lost. Thus the summit of a boldly sloping cliff whose declivity can be seen as the foreground of the view provides a more impressive outlook station.

In seeking to determine the order of steepness which is thought of as a bold slope when viewed from the summit I shall cite the case of Salcombe Hill on the east of Sidmouth in South Devon. The sea view from the summit (525 feet) is very impressive, and from the verge of the cliff the descent appears to be of formidable steepness. The general slope from the 500-foot contour to high-water mark is about 40 degrees as measured on the 6-inch Ordnance map.

I have found in many localities that a cliff appears to be of formidable steepness when the base is 2 spans of the hand (held at arms length) below the sea horizon, that is to say, in rough measurement 36 degrees.

When we stand on a cliff the fact that the sloping plane is visually ascending all the way as the eye travels from the summit to the beach is difficult to realize, and I have found by indirect measurement that the visual ascent is enormously underestimated in the spontaneous impression of the scene.

The view-points on the English coast from which the sea horizon stands high up in the picture and the scene has the impressive character associated with a cliff prospect are not limited to the immediate vicinity of the edge of broken rock in those localities where the hill rises steeply from the cliff summit. Thus near the Signal Station on Beachy Head (525 feet) where the grassy Down slopes smoothly at an angle of about 25 degrees to the cliff edge, the sea horizon is almost at the top of the field of view as recorded in a sketch which I made from this position.

The case of the sea view from Heytor Down in Southern Dartmoor, 1100 feet in height, is very different. This is 11 miles from the coast at Teignmouth, so that the general slope is little more than 1 degree. The sea is visible above a gently descending landscape. In two sketches which I made from different standpoints the horizon of the sea is slightly below the middle of the picture. Although the sea horizon was 41 statute miles away and almost 30 miles of water were included in the view the expanse of sea was not impressive, much less so than from the railway train when passing along the level shore between Dawlish and Teignmouth where the horizon is about 5 miles distant.

As we go farther west along the coast we reach the hardest rocks, primary metamorphic and igneous. On the long line of the cliffs in South-West Devon and in Cornwall there are places where the waves and weather have only succeeded in cutting a cliff of less than 100 feet in height yet the steepness of the hillside ensures an impressive character which is not displayed where cliffs of less than 100 feet have a plateau summit. Hope's Nose near Torquay is a familiar example. From this and other cases I venture on the generalization that the coastal outlook has the impressive character of cliff scenery when the land reaches the 200-foot contour at a distance of 660 feet (1 furlong) from high-water mark, even when the face of broken rock is less than 100 feet.

Measured on the 1-mile-to-1-inch Ordnance Survey maps [1] the length of coast with a cliff not less than 100 feet, or alternatively attaining a height of 200 feet within 1 furlong (660 feet) from the shore is 530 miles out of a total length of 1800 miles. Thirty miles are crumbling gravels of the Tertiary formations. Some of these, as along the Christchurch and Bournemouth Bays, have real beauty, partly on account of the sweeping curve of the coast, but because of their rapid wastage I omit them from my computation of the cliff frontage where a strip of top land should be purchased. This leaves 500 miles as the length of cliff lands which have to be considered in reference to the project of public ownership. Of this 500 miles the chalk cliffs in short stretches between South Yorkshire and East Dorset account for 51 miles. The Jurassic-Triassic rocks account for 126 miles, forming two belts, each continuous, one in North Yorkshire, the other in West Dorset and South-East Devon. The lengths of the two belts are approximately equal. Finally the hardest rocks which form the northern and southern coasts of the south-western or Devonian peninsula (meeting at Land's End) account for no less than 323 of the whole 500 miles of English cliffs.

Chalk rock, although not a hard substance, is compact in structure and strong in the mass. It therefore stands in nearly vertical cliffs which are often capped with steeply sloping turf as in the cases already mentioned.

The cliffs comprised in the geological categories of Jurassic, Liassic, and Triassic are composed of Oolite limestone, Lias, Red Marl, and New Red Sandstone. This belt of rocks traverses England diagonally and its truncated

[1] This is a first approximation which gives us the order of magnitude with which we have to deal. Measurement on the 6-inch-to-1-mile map would be preferable, but, as the main purpose is to estimate the area of cliff land required for reservation, minute indentations are of comparatively small importance.

ends appear on the east coast from Saltburn to Filey Brig, and on the south coast from Swanage to Teignmouth.

Boulby Head, north of Whitby (666 feet), is reckoned to be the highest cliff on the English coast. On the Dorset–East Devon front of the Jurassic-Triassic shore there are also many lofty cliffs as in the long line of cliffs from Seaton to Sidmouth.

The land on the top of the lofty cliffs of West Dorset and South-East Devon is for the most part of a plateau character and this is typical of high coasts where the strata are soft, the rock breaking back not merely where undermined by the waves and tides but where exposed to the salt sea winds which prevent the growth of sufficient vegetation to bind the surface.

After passing Teignmouth the coast of the English Channel from Torquay to Land's End continues to be mainly cliffs, but here the physical character of the rock is very different. The sedimentary rocks of the carboniferous and Devonian periods, which occupy the greater part of the coast, are much harder than the more recent sedimentary rocks from Yorkshire to South-East Devon, and even harder than these ancient sedimentary rocks are the metamorphic and igneous rocks which stand out at the promontories of the Start, the Lizard, and Land's End. The profile of this coast is characterized by a cliff face backed by a steep slope rising to the summit of hills of a few hundred feet only in height. The impressive character of the actual cliff is not dependent solely upon the attributes of height and precipitance, being everywhere enhanced by the evident strength of its substance. In structural character the rocks are of two principal classes, the slates in laminae and the granite in massive blocks. The slates of the south coast of Devon and Cornwall reappear on the north coast of the Devonian peninsula, but not elsewhere on the English shore. Their effect upon the marine outlook is largely a matter of tone and colour. In South-Western Cornwall and on the north coast of Cornwall the sea is of the oceanic blue. Near the Lizard the slates, which are often almost black and of neutral tint, serve on sunny days to carry depth of tone farther than that reached by the ocean blue. Between Tintagel and Boscastle on the north coast there is an even finer effect. Not only is the water itself, as I judge, of a somewhat deeper blue, but the slate is of a dark blue tint, and, lighted from pale blue sky and deep blue sea, carries the chord of colour down to a depth of tint rarely met with in the English scene. Thus on the stretch of Cornish coast which legend associates with King Arthur there is a scheme of colour which fully equals that which can be found beneath Italian skies or by the Mediterranean shore.

Between the slate cliffs of the south and north coasts of the south-western or Devonian peninsula juts out the promontory of Land's End, a dome or boss of granite, one of a succession of igneous upthrusts of which other members are Dartmoor, the Bodmin Moors and away to the west the Scilly Isles. The Land's End peninsula however is the only mass of granite upon the coast of England, and so the granite cliffs which extend for many miles between Penzance and St. Ives are a unique feature in English scenery. The "Land's End" in the popular sense, the terminal point of the extensive peninsula, is visited by people from all parts of the country, and the scene does not disappoint the expectations raised by the romantic suggestion of the name.

The granite, here bedded horizontally, rises in perpendicular cliffs and is so jointed in the horizontal and vertical planes that it has the form of cubic blocks. Thus England's farthest outpost on the Atlantic resembles a defensive rampart piled up by giants against the onset of the sea.

In order to frame a satisfactory scheme for the scenic preservation of these cliff lands the problem must be studied in accordance with the method of geographical science, that is to say, both from the general and the regional standpoint. Regionally considered, it is evident that the support for the project suffers from the great distances which separate the residents of our coast lands. North Yorkshire and South-East Devon have similar cliffs, but the communities concerned live far apart and are entirely unconnected in their local politics. When however we survey the coast-line from the general or national standpoint we cannot fail to be impressed by the importance of the fact that no town in England is more than 75 miles from the sea, that is to say not more than three hours by car, even for conscientious people. The sea coast, so readily accessible from all parts of the country provides the most beneficial climatic change obtainable in England, and is the principal holiday resort. The preservation of a belt of unspoilt land along the cliffs is therefore of great importance to the general public as well as to seaside residents, and should be made the joint concern of His Majesty's Government and of local authorities.

I shall assume that local authorities will fulfil the obvious duty of securing a public footpath along all the cliffs which are not already enclosed to the edge in a private garden. But this is not sufficient to secure the amenities of cliff scenery, for the splendid spaciousness of the ocean view cannot be fully enjoyed unless the landward side be free and open. With regard to the further steps which must be taken in order to secure the amenity of the cliffs I may refer to a planning scheme of one of the local authorities which requires the building line to be set back 100 yards from the cliff. But if the garden is to be in front of the house the cliff path will be hemmed in by the garden fence. I submit that the essential provision is that the frontage of the building plots should be set well back from the cliff, and that the belt of land thus kept open should be acquired as a public pleasance.

I come now to the calculation of the acreage of such a pleasance extending for the whole 500 miles of the English cliffs. In order to obtain the simple figures which are necessary for memorization and therefore for clear thinking we must employ the customary unit of English land measurement which is very characteristically the length of the cricket pitch. The distance between the wickets, 22 yards, is determined by the length of that antique instrument the chain. I take 5 chains, 110 yards, as a suitable breadth for the proposed pleasance of the cliffs. Ten square chains are 1 acre so that each acre of this pleasance has a cliff frontage of 2 chains, 44 yards. This is one-fortieth of a mile, so that the proposed pleasance has an area of 40 acres per mile and the whole national reservation extending along the 500 miles of English cliff an area of 20,000 acres.

Let us compare this with the area of the districts most favoured for acquisition as national parks. The New Forest has an area of more than 64,000 acres,

and the proposed national parks of Lakeland and Snowdonia are on the same scale, that is to say more than three times the size of the proposed reservation of the cliffs.

Under the provisions of the Town and Country Planning Act, 1932, local authorities have the right to purchase land for public use. Their power to do so is limited by rateable value. Where the cliffs come within the boundaries of the larger seaside towns the local resources are ample for the purpose, and the convenience of undivided control would probably lead the local authority to prefer acquisition without contribution from the Exchequer. Matters are very different on the long stretches of coast comprised in rural districts, and it is precisely these less populous parts of the cliff coast, especially in the rural county of Cornwall, which are of most importance for national recreation. It would seem therefore that for the acquisition of cliff lands for public use on the less populous parts of the coast it would be entirely just and right that there should be a contribution from the National Exchequer.

Let us consider on the other hand the consequences of a policy of *laisser faire*.

Much of the 500 miles of cliff land is extremely attractive for house building on account of the lovely view, and this applies now more than formerly because of the great increase of holiday residences, week-end houses, and camping huts. When the lovers of scenery revisit some favourite cliff walk and see that building has begun, they throw up their hands in horror and rail against the mercenary spirit of people who wantonly destroy England's beauty. But this attitude of mind shows a want of imagination. Let the visitor put himself in the position of the small landowner deriving a meagre return from the produce or the rent of cliff land, which is mostly of small agricultural value. When he is offered a building price for plots of land he sees his way at once to easier circumstances of life, and let us not forget that when financial circumstances become easier the world at once assumes a cheerful aspect and the eye becomes more tolerant of disharmonies in scenery. Moreover in rural districts it is not only the landowner who welcomes the extension of villadom to cliff lands for the arrival of even a dozen new families in the neighbourhood makes a difference to the village shopkeeper.

Where, on the other hand, the cliff fields are now part of a large property the inducement to sell for building purposes will be very great at the time of the next succession as a means of meeting the death duties which are levied upon large properties on a destructive scale.

Taking 1 chain, 22 yards, as the building frontage of the plot required for each modest seaside villa, there would be 80 houses per mile, or 40,000 for the whole 500 miles of the cliff coast. The report of the Ministry of Health shows that the number of houses built in England during the six months ending 31 March 1935 was no less than 160,000, so that it would be rash to cherish the hope that a long time would elapse before the wild cliff lands of England could be transformed into mere villadom.

Pending a valuation survey, the following calculation will serve to give an idea of the scale of expenditure required for the acquisition of the cliff lands for public use, and the relation of that cost to the expenditure upon other public undertakings of a cognate character. The agricultural value of cliff

land is generally small, the price of a building site for which water, drainage, and other services have been provided is high, but the cliff lands as a whole have at present no such services. An arbitrated value at the present time should therefore be between the agricultural value and the prospective building price. Basing my estimate upon some actual cases I take £100 per acre as a first approximation for the value of cliff lands outside the boundaries of prosperous watering-places. Twenty thousand acres at £100 per acre is two million pounds. The comparison which I suggest is with the cost of slum clearance, for slum clearance and the preservation of wild scenery ought not to be put into entirely separate categories. On the contrary, the project for slum clearance and that for national parks ought to be envisaged together as complementary parts of one great movement for saving England from what is mildly termed undue urbanization, a condition that is to say in which the towns are not fit to live in and the countryside not fit to look at.

It will suffice for our purpose to quote the proposed expenditure by the London County Council on slum clearance and rehousing which amounts to a capital sum of no less than thirty-five million pounds.

In 1929 the Government appointed a Committee to consider the advisability of establishing national parks under a national authority. Upon the evidence of the expert witnesses, of whom I was one, the Committee recommended that a national authority should be constituted for the purpose, and national expenditure authorized. The Government however have not given effect to the recommendation of their Committee.

The Town and Country Planning Act, 1932, has modified the problem of national parks by giving local authorities some of the powers for acquiring reservations of scenery for which it had previously been considered that a national authority would have to be constituted. Nevertheless there is still the need for a national authority furnished with funds and charged not only with duties of supervision in matters of scenic preservation but with the obligation of initiative. There can in fact be no proper planning for the preservation of English landscape whilst the only competent authorities are those whose outlook is necessarily restricted to a single corner of the country, and this applies particularly to the case of the cliff lands.

THE EXPLORATIONS OF JOHN GUY IN NEWFOUNDLAND

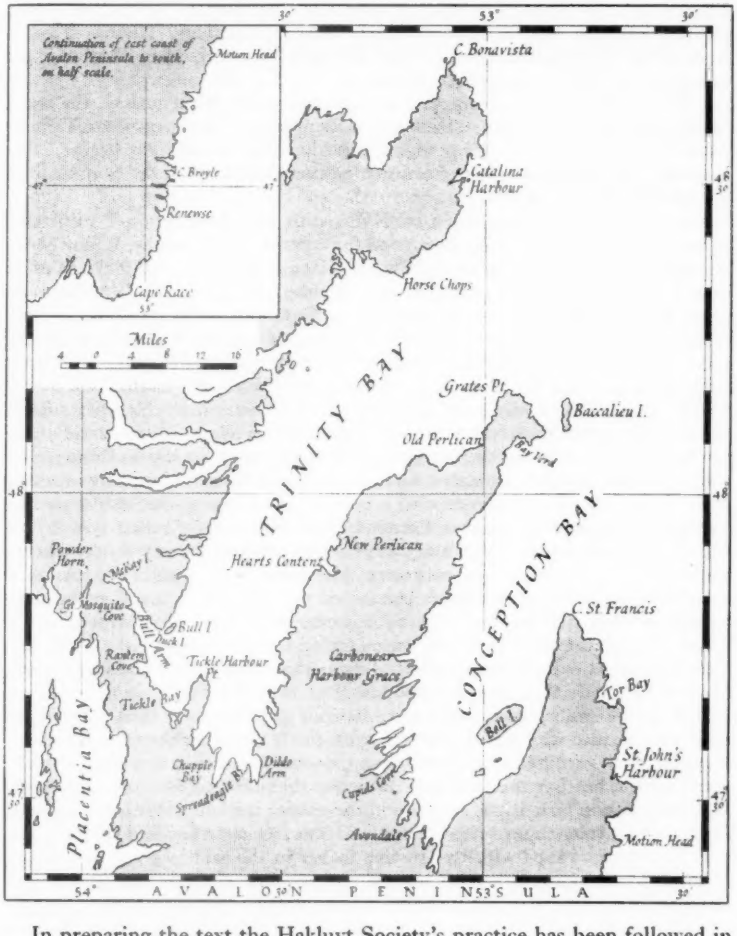
J. W. DAMER POWELL

JUDGE PROWSE'S 'History of Newfoundland,' 1896, p. 133, contains a reference to a manuscript in Lambeth Palace Library written by John Guy, who sailed from Bristol in 1610 and founded the first English colony in that island. This manuscript, which the author did not discover until after his book was in print, is bound up in a miscellaneous volume of voyages (MS. 250) and consists of twelve folios, with a title page on which is written in a different hand, "A Journall of the voiadge of discoverie made in a barke builte in Newfoundland called the Indeavour, begunne the 7 of October 1612 & ended the 25th of November following. By John Guy of Bristow." It apparently has not been examined by any later writer, and a comparison with the account published by Purchas [1] under the heading "Occurrents in Newfoundland," as "one of them writ it in his own termes," leaves no doubt that Guy's MS. was the source from which he derived his information. The signature "John Guy" occurs in the narrative four times, and is identical with that on a document in the Public Record Office signed by Guy when Mayor of Bristol in 1619, so apparently the manuscript is an original in his own handwriting. The period of the *Endeavour's* voyage from the time she sailed from Cupids Cove, the site of the colony, until November 5, except for one paragraph, was much abridged by Purchas, and included in the matter left out is a list of the *Endeavour's* crew, pioneers of English dominion in Newfoundland. Eight place-names, viz. Avon, Mounteagle Bay, The Elbow, Truce Sound, Savage, Alhallows, Flagstaff and Passage Harbours, failed to become established, as they are not found on any old or modern maps that the writer has seen. They have been identified with more or less certainty by the aid of Admiralty Chart No. 296 (Trinity and Conception Bays), on which the other place-names mentioned, already in use before Guy's time, will be found. The portion from November 6 to 8, giving Guy's description of the Indians, was copied by Purchas practically verbatim and is therefore omitted.

It is impossible to say if Guy explored any new ground. Some parts of the Newfoundland coast had been visited annually, since John Cabot's discovery of the fisheries in 1497, by numbers of English, French, Portuguese, and Spanish fishermen, who arrived in the spring and left in the autumn. It is evident that the east side of Trinity Bay was already known, as the "way overland" to Conception Bay is mentioned. Guy entered "the sound" (Bull Arm) in the "good hope" that it would "bring them" to the Bay of Placentia, and as in this part of the voyage the only place-names referred to are those given by himself, it is probable that he had no information about the west side of Trinity Bay. Sir Humphrey Gilbert's annexation in 1583 had not been followed by permanent settlement, so there had been no incentive for explora-

[1] 'Purchas His Pilgrimes,' 1905 edition, vol. xix, p. 419. The portion given by Purchas has also been reprinted by Mr. J. P. Howley in his work on the aborigines of Newfoundland, 'The Beothucks or Red Indians,' Cambridge 1915. For Guy, see article "John Guy: Founder of Newfoundland," *United Empire*, vol. XXIV, 1933, p. 323. The *Endeavour*, built in 1611 at Cupids Cove, was a decked vessel of 12 tons.

tion, except to find fishing stations, until Guy was sent out by the London and Bristol Newfoundland Company to "obtayne a safe and free commerce" with the Indians and "to take actuall seazin and possession" of the country, "never by grace and assistance of God to be discontinued."



In preparing the text the Hakluyt Society's practice has been followed in the use of capital letters and punctuation:

"The Jornall of our voiadge in the Indeavour begunne the 7 of October 1612.

"October 7. This nighte by sayling & rowing we came to Harbor de Grace as farre in as the Pirates forte, wheare the Banke shippe roade, wheare we remayned untill the 17th day of the sayde moneth & in the meane time did bring the Banke shippe a shoare, land the salte upon the higheste parte of the grownd theareaboutes, putting yt up in a round heape & burning of yt to

preserve yt. Two anchors & two old Junkes we lefte upon the beache. The quantitie of salte was about fifteene tonnes.

"17. We departed from Harbor de Grace & that nighte came to Greene Bay,[1] both the barke & the shalloppe. Theare weare in the barke fowerteene viz. John Guy, Mr. Teage, Mr. Croote, George Whittington, Franncis Tipton, Edwarde Perrie, James Holworthy, John Crowder, James Babacucke, Georg Davies, Thomas Rowlie, George Lane, George Vaughen, Thomas Tayler. And in the shalloppe five viz. George Wichalle, Wm. Hadden, Bartholomew Percevall, George Frewin, Samuell Butler.

"18. At two a clocke in the morning we put out of Greene Bay, the wind North, we spent all that day in the barke to double the Grates to goe into Trinitie Bay, but could not & soe late at nighte came backe to Greene Bay againe. The shalloppe proceeded & that nighte attayned unto a harbour of the Southside of Trinitie Bay called Hartes Content.

"19. We put out againe the wind NW a stiffe gale, we crossed Trinitie Bay & came to a roade under the land good for a [MISSING] Westerlie & Northerlie windes. Theare was harde by us [MISSING] Island, wheareby we tooke yt to be that which is called S. Catalinaes, yt lyeth from Baccaleau NNW. Heere we roade without being able to goe a shoare for want of a boate, untill the 21 day, when at 4 of the clocke in the after noone the wind came Northerlie & soe we put to sea to get up into Trinitie Bay & sayled all that nighte untill midnighte with our mainesaile out, but after taken in untill day. Our course was SW & SWBS moste commonlie & sometimes S & SBE to fetch the Souther side of the bay. When yt was daylighte, we fownd ourselves neerer the south side than the Northside, about two leagues further up in the bay than Hartes Content: by twelve of the clocke the same day, we came to the Harbour that the way overland from Avon in the Bay of Conception is marked unto, wheare our shallopp came happelie unto us from Hartes Content. This Harbour is called now by us Mounteagle Bay,[2] yt lyeth in S & theare is ane Iland at the entrannce, wheare we fownde good stoare of scurvie grasse. Heere we stayed untill the 24th day & then both the barke & shalloppe proceeded partelie by sayling & partelie by rowing unto a harbour in the South bottome of Trinitie Bay, which now is called by us Savage Harbour.[3] Heere we fownd some savage housen, a holbarte, a wooden target & small coffins made of the barke of trees & a broad way leading from the sea side throughe the woodes. The 26th day being about to depart heerehence & under sayle contrarie windes put us in againe & then I sent some to follow the said way to see how farre yt went & wheather they could see any savages. Who within ane houre returning, declared that they saw a great freshe water lake, wheather the said way did leade them & two fires, one upon ane Iland in the said lake & ane other upon the side of the lake. Whereupon John Guy with fourteene more went to the said lake, wheare they had sighte of the said fires & of a canoa with two rowing in her in the said lake and soe goeing through the woodes with what silence was possible alongste the lake side at twilighte they came within halfe a mile of the place of one of the said fires, wheare remayning two houres within nighte after they proceeded & came to the said place wheare they fownde noe savages, but three of theire housen, wheareof two had been latelie used, in one of the which the hearth was hot. The savages weare

[1] Now called Bay Verd.

[2] Either Dildo Arm, or Spreadeagle Bay, which adjoins it on the west side. If Avon is the present Avondale in extreme south of Conception Bay, the "way overland" by the shortest route would be to Dildo Arm.

[3] Chapple Bay (?), which extends farther south than its neighbours, Spreadeagle Bay and Dildo Arm.

gone to the said Iland, wheather we could not goe for want of a boate. We fownd theare a copper kettle kepte very brighte, a furre gowne, some seale skinnes, ane old sayle & a fishing reele."[1]

After examining the village, a description of which will be found in Purchas, "everyone returned by the moonelighte goeing by the brinke of the lake unto the entrannce of the made way . . . & soe came to the barke."

"The nexte day we put foorth a flag of truce being a white flag. The lake is about a mile from any parte of the harborough. Theare issueth out of yt a very great brooke enough to drive three fordges with the currant. Theare was seene at theire cabanes showes [shoes] made of deere & seale skinnes very artificiallie. . . . The 30th without any further business with the savidges, we departed thence to the northerne side of Trinitie Bay and anchored all that nighte under ane Iland.[2] The 31st we rowed into ane harborough which now is called Alhallowes,[3] which hath adjoyning unto yt very high land from whence was seene a great bay which ranne into the land North. Yt was to the neereste place about 3 leagues over land SW & some part of yt did lie NW. This must needes be the Bay of Placentia.

"[November] The barke & shalloppe put out of the said harborough to discover the bay within the headland which now is called the Elbow [4] & being foorth the shalloppe was sent before to see wheare theare was any harborough theare & the barke returned to Alhallowes. Word was broughte that theare was noe harborough, but a sandie banke for a league of a gray colour & that a brooke came foorthe apparentlie in one place, but that theare went soe greate a sea as they could not get a shoare. They gave a good reporte of the likelihood of the place to yeeld good land. When they weare a league of theare was not fower fadome water.

"The 3 day we departed from Alhallowes & went Northwards towards a sound, which we weare in good hope would bring them to Placentia & theare in a harborough one the wester side of the sound we anchored, this lieth 3 leagues from Alhallowes North. Within a league of this harbour in the way from Alhallowes, lieth ane other harbour that hath before the entrannce a good space of two rockes. Theare our boate saw nine savage housen used by them in theire coasting: the sownd heere is about two miles broad.[5]

"The 4th we put forward in the sound. The firste reach lieth NBW westerlie one league, from thence NNW halfe a league & from thence WNW one league, wheare the sownd did end.[6] In that place was fownd eighte or nine savage housen in severall places and a way cut into the woods, which being prosequuted, yt was found to lead directelie to a harborough in the Bay of Placentia, distant onlie two miles W, which harbour in Placentia Bay is now called Passage Harbour:[7] a river came into yt from the NNE. They which went fownd theare

[1] They also found "stags hoofes." Purchas has "elkes," also known as moose, which have only been introduced into Newfoundland within recent years. The native deer are caribou or American reindeer.

[2] Bull Island.

[3] Rantem Cove.

[4] Tickle Harbour Point, on the eastern side of Tickle Bay, which has a sand bank at its inner end as described.

[5] Great Musquito Cove.

[6] This gives 7·5 miles, which is practically correct for Bull Arm from Duck Islands to the end.

[7] On south side of Isthmus of Avalon; the river is now called the Come by Chance Brook.

fishe hookes, a small copper kettle, a fishing line & a lead, a target, a staffe & a French basket, but noe shew of housen. In two houres & a halfe twelve of the companie which went returned. Heere was fownd a new canoa a shoare, which now remayneth in the woods at Pernecan, by reason of stormie weather yt could not be broughte any farther.

"The fifte day John Guy & tenne with him went from the barke by land to the top of a very high hill,[1] to take a full view of the Bay of Placentia and all the contrey about. In theire way they waded over the river that runneth into Passage harborough. Yt is five times greater than any other river or brooke yet seene to the Southwards: because the foggieness of the weather hindred the prospecte they remayned theare all nighte. About sunset yt cleered up from the SSW to the Northwards by the weste & then the wester side of the Bay of Placentia was seene to lie W, WSW & SWBW & SW. About 10 leagues of theare was ane open into the maine sea noe land appearing, in which sownd theare were two small Ilands in a righte line. SWBS. theare was land by which I think that all that lyeth between the said open & Cape St. Lawrence, which is the cape on the wester side of the Bay of Placentia, are Ilands & that Passage Harbour before spoken of is in the bottome of the Bay of Placentia.

"The 6 day they returned to the barke from the high hill & about two of the clocke in the afternoone, about two houres after the returne, theare was perceived a fire in the sownd a mile of. Whereupon all the companie repayred aboorde, because yt could be noe other than the doeing of savages."

Guy and his party were soon afterwards visited by eight Indians in two canoes and a friendly interview ensued, of which a long account is given in Purchas. The Indians departed the same night, taking "our white flag with them," and on the following day the explorers commenced to build "a house to shelter us when we should come theather heereafter, upon a small iland of about five acres of grownd which is joyned to the maine with a small beache," a description which can only apply to McKay Island (see Admiralty Chart No. 2,649, Bull Arm). On the 8th, they "beganne to returne out of the sound," and "came that nighte to the harbour that we weare in at our entring (i.e. on 3 November), which we call Flagstaffe Harbour, because we fownd theare the flagstaffe throwen by the savages away." The sailing of the *Endeavour* from Alhallows on November 3 having been omitted by Purchas, the reader would naturally assume that the meeting with the Indians occurred at that harbour. The manuscript proves however that the *Endeavour* sailed 3 leagues (9 miles) to Flagstaff Harbour, anchoring on the same day, and that the parley took place after she had "put forward" to the end of what Guy named Truce Sound, or, as it is now called, Bull Arm. The following is the remainder of the unprinted manuscript and is continued from where Purchas abruptly finished.

"10. At this point we departed from Flagstaffe Harbour and came that nighte to a harbour called Hartes Content.

"11. The wind being NE & the snow contynewing all day kept us in Hartes Content.

"15. The barke and shalloppe departed from Hartes Content. Before nighte the barke doubled the Grates & sayled betweene Baccaleau & the maine into the Bay of Conception, and as they sayled they saw above a dozen stags upon the

[1] Possibly the Powder Horn, 1045 feet.

bare hills neere Greene Bay. After seaven houres turning in the bay, we boare roome with Greene Bay to stay for the shalloppe and at 11 of the clocke at nighte we anchored in the Eastermoste roade of Greene Bay. We fownd by waying of our anchor that the rockes had worne a sunder our hawser that we roade by, for the anchor & twentie fadome of the hawser was lefte behind, for that & by reason of a sea which came into the roade out of the South, we soughte to recover the other roade of Greene Bay: which as we weare about to doe the shalloppe came sayling out of Trinitie Bay without the canoa,[1] which they had towed from Truce Sound unto Old Pernecan wheare foule weather forced them to land yt & the sea was soe wroughte as they could not come aboord us. We in the barke, because we could not double the head of Greene Bay, stoode to the offing and standing backe againe, perceiving that by reason of sagging in with the smalnes of the winde we went to leewarde, we stoode out againe & being foorth in the offing yt blew soe much wind at South as we weare forced to hull the moste part of that nighte.

"15. This day when yt cleered up we saw land to the NW of us, which because we imagined that we had gone to the Northward by hulling, we made accompte that yt had bin parte of the land on the Northside of Trinitie Bay. This nighte also we weare forced to hull by reason of the fiercenes of the wind.

"16. This day we saw the land againe & still accompting yt to be betweene Bonaviste & the Horselips[2] we wroughte theareafter, sometimes goeing S & SSW & SBE as the wind would permit us & sometimes NW to get neere the land.

"17. Yt was a fog & we could not see above a mile from us, untill noone we went SSW & then being desirous to get neere the land to make yt to be sure wheare we were, we went NW & weare within hearing of the rut of the shoare before we could see yt, and presentlie yt pleased God to send us a cleere the wind WNW & then we fownd our selves something to the Southward of Renoose. Then knowing that yt was the currant that carried us, the firste nighte that we hulled, to the Southward and that the land which we saw alwayes was to the South of Cape St. Frannces, yt was God's doeing that we went not to the South of Cape Razo.

"18. Being in the offing from Cape Broile, a SE wind came & broughte us to Torre Bay wheare we arrived at nighte.

"19. We remayned heere expecting a fayre wind & having noe boate with us we made meanes by oares & a hogshead to get some of our companie a shoare.

"20. About 2 of the clocke in the morning the wind came to SE whereupon we departed from Torre Bay, but before day the wind came to SW & soe weare faine to recover Greene Bay againe in the roade which we left. This nighte was ane exceeding great storme, the wind WNW.

"21. We put foorth of Green Bay, choosing rather to continew turning in the bay, than to ride in suche a roade to the hazard of the losse of all our anchors.

"22. We got into the roade of Great Belile,[3] yt blowing a fierce gale of wind at WNW. About Midnighte the 24th day the wind being SBE, we departed from Belile, but before we had proceeded as farre as the end of the said Iland, the wind came to the SW & WSW & blew soe much as we could beare noe sayle, but lay a hull untill day, in doubte to be put out of the bay & makeing accompte that we had great good hop, yf we could recover the roade from whence we came: and while we weare thus perplexed the wind came to the North and broughte us in safetie God be praysed to Cupers Cove[4] by tenne of the clocke in the forenoone the 25th day of this moneth of November, wheare we understoode that

[1] See November 4.
[2] Now Horse Chops.
[3] Bell Island, in Conception Bay.
[4] Now Cupids Cove.

the shalloppe which we lefte in Greene Bay eleaven days agoe was caste away the morrow after, but all the men saved, who put the sayle & theire apparell in safetie ashoare & came homeward by land to Carbonera in 8 days, having nothing to eate but what they could find by the way & from thence came in safetie home on Sunday the 22nd of this moneth. Presentlie after the barke was arrived the wind was westerlie."

The manuscript concludes with a rough sketch entitled "the picture of the savages canoa."

FALLS OF THE KAIETEUR ESCARPMENT, BRITISH GUIANA

IN the *Journal* for March 1935, on p. 300, we published a note on the newly discovered falls of the Ipobe River which with the permission of H.R.H. the Duchess of Kent had been named the Marina Fall. The brief account of the discovery of Messrs. Bracewell and Forte, and of the action taken by the Colonial Office to meet the desire of the discoverers in regard to the name, was based upon a communication which the Secretary of State for the Colonies had very kindly directed should be made for the information of the Society.

We have since received fuller descriptions and photographs of the Marina and other falls, and are glad to publish Dr. Williams' account of the air reconnaissance sent us by the Director of the Geological Survey, followed by the pilot's report on a passenger flight on 23–26 March 1935, during which more new falls were seen.

AERIAL RECONNAISSANCE ALONG THE KAIETEURIAN ESCARPMENT IN BRITISH GUIANA

DR. G. J. WILLIAMS

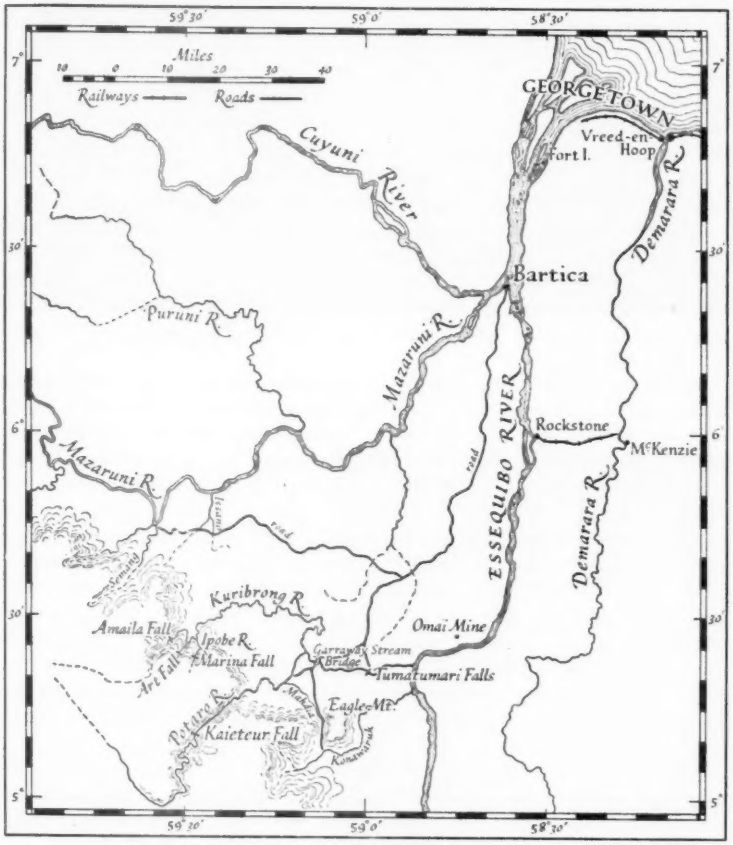
Communicated by Mr. D. R. Grantham, Director of the Geological Survey

A large part of the interior of British Guiana has recently been opened up by a new road system, financed by the Colonial Development Fund. The system commences at Bartica, a port on the lower Essequibo, and has two branches leading to the Potaro and Mazaruni mineral fields. In order that some authentic knowledge of the country fed by the roads may be obtained, a geological survey was temporarily instituted to survey the mineral resources of this territory. This work is now nearing completion and the following brief remarks refer to the more geographical aspects of their surveys.

The pioneer explorations of Schomburgk in the 'forties and of Brown and Sawkins in the 'seventies outlined the main geographical features of the Colony, and later more localized surveys in areas of economic importance made by officers of the Lands and Mines Department, and the current surveys of the Guiana–Brazil Boundary Commission, have together brought the Colony beyond the stage of being unexplored. Nevertheless but few topo-

graphic maps are yet available, and even the broader geographic features are still unknown in some of the less accessible districts.

The Colony is crossed obliquely by a high sandstone escarpment, about 2000 feet high, and trending in a south-easterly direction from the Venezuelan border across the Wenamu River (a tributary of the Cuyuni), the Mazaruni at Peaima Falls, thence across the Semang and Issano, to the Kuribrong River



which it crosses at Amaila Fall, and the Potaro River at Kaieteur Fall. The escarpment is broken in the eastern part of the Colony, but reappears in Dutch Guiana.

The escarpment is the outcrop of the edge of a series of sandstones and conglomerates resting on an ancient metamorphic and plutonic complex, the surface of which, out-cropping from beneath the escarpment, forms the low country that occupies most of the Colony. Gold workings are scattered throughout the smaller streams draining the low country, from the ancient

rocks of which the gold is derived. Diamond workings however are restricted to creeks comparatively close to the escarpment, and it is almost certain that the diamonds are derived from the sediments of the escarpment.

Consequently the work of the Geological Survey has been mainly in the foothills and lowlands near the base of the escarpment. More or less complete contoured topographical and geological maps on a scale of 1 : 50,000 representing 2000 square miles of country have already been prepared for publication.

The country is heavily clad in a tall forest growth which, on the lowlands, obscures the narrow gullies of what is almost a "bad land topography." Even along the escarpment bare cliff faces are only intermittent. Consequently comprehensive views of the country can seldom be obtained from the land, and the only practicable method of finding the natural features is by blindly cutting trails through the forest: a method that is slow, arduous, and expensive, and on the escarpment becomes almost impossible on account of the difficulty of moving camps over the rough forest-clad talus slopes and rock faces.

Recently however the officers of the Survey have availed themselves of opportunities of testing aerial methods of reconnaissance. Over the lowlands aerial photography is of more value to the geologist than to the topographer: the tints of the canopy of the forest are distinctive over certain superficial geological formations, but the high forest obscures all but the bolder topographic forms.

In the steeper country along the escarpment however aerial methods are admirable, and it is in this zone that the Survey has succeeded in doing much useful work that would be impossible by any other method. The principal result of geographic interest lies in the revelation of a series of magnificent waterfalls, some of which had been known previously, but others are new discoveries.

The famous Kaieteur Fall, formed where the Potaro River plunges over an overhanging cliff with a vertical drop of 750 feet, was seen and photographed from the air for the first time, and a landing was made on a stretch of still water above the brink. Although one of the major falls of the world, it still remains comparatively unknown. Its setting is entirely unspoiled and will always remain so, as the surrounding country has been declared a national park. It may now be reached from Georgetown along the new road and by boat up the Potaro River from the Potaro gold-field; or it can be reached in two hours by air from Georgetown.

The Kuribrong River crosses the escarpment in Amaila Fall, consisting of a series of cataracts and vertical drops, the highest of which is 100 feet high. Several other smaller falls exist on tributaries of the Kuribrong River. The largest of these was first seen from the land by Messrs. S. Bracewell and P. A. Forte in May 1934 at a distance of 14 miles, but its position remained unfixed until it was located from the air on the Ipobe River on 29 November 1934. This was the day of the wedding of T.R.H. the Duke and Duchess of Kent, and permission has been graciously given to name it Marina Fall. It is probably about 100 feet wide, and has an almost vertical drop of over 300 feet, cascades bringing the total height to over 500 feet. Although it is only three miles from diamond workings, it had remained unknown on account of the rough talus country intervening. Another fall, with less volume of water,

Kaieteur Fall from the air

2. Marina Fall, Ipobe River

3. Fall two miles north-west of Marina Fall

4. Amaila Fall, Kuribrong River

5. Fall on a tributary of the Semang River

passes over an overhanging cliff two miles west-north-west of this fall, and has been named Art Fall after the aviator through whose courtesy the flights were made. The vertical drop is probably about 250 feet.

More recent flights have revealed another series of falls in the basin of the Semang River, a tributary of the Mazaruni River, but further work is necessary before these falls can be accurately placed.

The officers of the Survey are deeply indebted to Mr. A. J. Williams, pilot and owner of a Wasp-Ireland amphibian, and to Mr. A. E. Horne, for their generosity in connection with the reconnaissance flights. The mapping is largely the work of Mr. S. Bracewell, and the photography of Dr. G. J. Williams.

PILOT'S NOTES ON A FLIGHT FROM GEORGETOWN TO THE POTARO, MARCH 23–26, BY A. J. WILLIAMS

Communicated by Mr. Charles Day

The passengers on this flight were Mr. C. C. Day, of England, Captain Irving Johnson, Charles Tift, and Arthur J. Murphy, of Captain Johnson's yacht *Yankee* of Gloucester, Mass.

The plane was a five-passenger Ireland flying boat, powered by a 450 h.p. Wasp C engine.

The machine took off from Georgetown and passed over the Demerara River and Vreed-en-hoop to follow the coast to the Essequibo mouth. From there they flew upstream over Fort Island, site of an early Dutch Fort, ruins of which are still standing; and over Bartica, at the confluence of the Mazaruni and Cuyuni rivers with the Essequibo, which is the take-off place to travel either by road or river to the important mining areas in this colony. The plane continued right up the Essequibo, passing over Rockstone, and the worked-out Omai gold mine, which produced 100,000 ozs. before closing down. Going up the Potaro River from where it runs into the Essequibo the passengers saw Tumatumari, a dangerous fall around which river boats have to be portaged. From there it is only 5 miles to Garraway Stream, the first landing place. The occupants of the plane spent the night there and had ample opportunity to see the Denham suspension bridge, Horne's gold workings, and other things of interest in the vicinity.

Next day, the plane having been refuelled, the flight continued straight up the Potaro as far as the Kuribrong, which it followed to Amaila Fall. As the plane was cruising Captain Johnson observed what appeared to be another fall some distance away in the north-easterly direction. He pointed this out to the pilot, who immediately sent the plane towards it. After fifteen minutes' flying they were close enough to the fall to observe it in detail and circled round it to get photographs. From then on the flyers observed a succession of waterfalls all running off the same escarpment as the one they had first observed.

After leaving Amaila, the explorers continued flying slightly to the north and east along the escarpment face and counted eighteen cataracts before they lost count. Five of the falls discovered were over 500 feet in sheer drop.

After the thrill of this discovery (although this sort of thing is not new to Captain Johnson and the members of his crew) the party turned westward. They passed over the recently discovered Art's Fall and Jane's Fall, and

beautiful Marina, and finally arrived at the mightiest of all, Kaieteur. They landed on flat water about half a mile above the fall and the party spent the night at the rest-house. Next day they returned to Garraway Stream, flying down the Potaro River through the magnificent Gorge of Kaieteur.

From Garraway Stream the party took a motor lorry and travelled 12 miles up the Potaro road to the Minnehaha Development Co.'s dredge and sluice workings in the Mahdia valley near Eagle Mountain, and had breakfast with Mr. R. G. Humphreys, the owner of the mining property at Mahdia House. Later they returned by lorry to Garraway Stream. The next morning they left by plane to return to Georgetown and followed the Potaro and Essequibo again to Rockstone, from where they crossed over the jungle to the Demerara River to Mackenzie, where they observed the Bauxite mines of the Aluminium Co. of America, and then started down the Demerara River. They passed over the timber grants and narrow-gauge railroad on the estate of Mr. E. S. Sill. From Mr. Sill's place they flew close to the surface of the Demerara River until they were right close to the yacht *Yankee* in Georgetown Harbour.

Captain Johnson has asked that the first of the newly discovered group of falls should be named after his yacht *Yankee*.

The native names Kaieteur and Amaila were obtained by Mr. Barrington Brown, who discovered these falls in 1870. A note on the discovery with pencil sketches of both falls, was published in the *Journal* for November 1932, vol. 80, p. 436. In directing that a report announcing the discovery of the Marina Fall should be sent to our Society the Secretary of State for the Colonies intimated that he was not unmindful of the principle that in general it is preferable that geographical features should bear native names, but having in mind that precedents existed for giving non-native names to other well-known waterfalls, he decided that the circumstances of the case required that attention should be paid both to the compliment intended by the name proposed, and to the loyal sentiment which actuated the suggestion. The proposal having been accordingly submitted to Her Royal Highness, and graciously accepted, the Acting Governor of British Guiana was so informed (*Geogr. J.*, March 1935, vol. 85, p. 300).

In the papers printed above there are names suggested and used without further ceremony for the new falls, which may be considered a little out of keeping with the first three. One is also ambiguous, but it appears that the name applied perhaps temporarily to the new fall 2 miles north-west of the Marina Fall is the abbreviated Christian name of its discoverer, the enterprising pilot who has been operating in British Guiana since November 1934. We are informed that the naming of places in the Colony is not ordinarily subject to any authority, but that it is legally compulsory for every prospector who pegs a claim to give the creek a name, and that a semi-official publication even provides a list of short names, from Ass to Zeus, considered suitable. Most of the names however die with the workings, and the position of the place to which each has been applied is often not known within 10 miles. It may be thought that the time has now come when authority should intervene in the naming of all major geographical features, if not of mining claims.

TABVLA IMPERII ROMANI

AT the Congress of the International Union of Geography at Cambridge in 1928 Mr. O. G. S. Crawford, the archaeological officer of the Ordnance Survey, proposed a special edition of the International 1/Million Map to cover the whole extent of the Roman Empire, and a resolution approving this proposal and commending it to the States interested was passed at the Congress. The proposal had the great advantage that it had a model already in existence—the Map of Roman Britain on the same scale published by the Ordnance Survey in 1924 in which the conventional signs appropriate to such a map had been worked out to a large extent.

The project had been referred to a Commission of the Union, which under the Presidency of Brigadier Jack met at Florence in the Spring of 1929. It was then resolved that the object of the Commission was to produce a map of the Roman Empire which will be of use both to students and to the general public: therefore to be kept clear and simple. It was to be historical and not archaeological: not to serve as a guide or index map of ancient monuments, but to show as far as possible the distribution and character of population in Roman times, the Roman names of towns and natural features, and the economic and social conditions of the period. The Commission adopted the Ordnance Survey Map of Roman Britain as a model for content rather than for style, for the style was strictly conditioned by the decision that the Map of the Roman Empire should be a special edition of the 1/Million Map, not only on the same sheet lines, but using the actual plates of the water and the relief. The red road plate would be omitted, and all the new work done upon a new black plate. The Ordnance Survey undertook to produce the sheet N.30 named Edinburgh, but actually covering Britain from the Forth down to 30 miles north of London.

This sheet, together with a provisional edition of sheet K.33 Roma, compiled by Professor Lugli and printed by the Istituto Geografico Militare at Florence under the supervision of General Vacchelli, was considered at a further meeting of the Commission held at Paris in September 1931, when it was tentatively suggested that the management of the map should be entrusted to the Central Bureau at Southampton during the intervals of the meetings of the International Union. Doctor W. F. Hume, representing Egypt, promised to proceed with the compilation of the Egyptian sheets, and the delegates of Spain presented compilations of two Spanish sheets.

The next meeting of the Commission was held at Rome in November 1932 by invitation of the Italian Government when several more sheets were presented for consideration in provisional form. The Commission then decided that the map should be extended to include all regions where traces of Roman penetration had been found, and that each sheet should represent the conditions at a date not necessarily the same for each sheet, but the date of the highest development of the region under the Romans. It was further agreed that the relief should be shown by the layer tints of the International Map, and that when the ancient name of a site was unknown the modern name should be shown in italic characters and between square brackets; but it was not

explicitly provided that the modern name should always be shown in small italics under the ancient name in Roman capitals. This important principle had however been adopted upon the Edinburgh sheet.

At the meeting of the International Union of Geography at Warszawa in August 1934 the Commission held a fifth meeting and surveyed the progress made. By that time about ten sheets were either published or in proof, and very naturally the style of the different sheets showed some divergence due to individual initiative and local necessity. It was then decided that the map should bear the official name TABVLA IMPERII ROMANI. Up to that date about eight countries interested had taken some share in the scheme, and there were ten others whose interest had to be obtained if the map was to be completed. It was necessary also that those countries which had not produced the relevant sheets of the 1/Million Map for which they were responsible should be encouraged to do so.

Hitherto the map had had only a semi-official character. The Commission felt that the time had come to regularize it by considering and confirming the agreements already reached and by securing the formal adhesion to the project both of those who are already taking a share more or less officially, and those countries which had not yet taken any interest in the matter, but whose cooperation was essential if the map were to be strictly related to the conventions of the International Map. The British Government therefore issued invitations for an International Congress to be held in London in September 1935, and the Council of our Society were pleased to place the Society's Hall and adjacent rooms at the disposal of the Organizing Committee for the Congress, which assembled on Monday September 23 and was opened on behalf of the Government by the Rt. Hon. Sir John Davidson, Chancellor of the Duchy of Lancaster. Brigadier M. N. MacLeod then took the chair as President of the Congress, and in a brief introductory address outlined the scheme of work and suggested that the Congress should appoint two Commissions, Archaeological and Cartographical, to consider details. These Commissions met on the two following days, and at the second plenary session on Wednesday September 25 the results at which they had arrived were confirmed, after which the Delegates were entertained at afternoon tea by invitation of our Society, and dined at Lancaster House in the evening at the invitation of His Majesty's Government.

The twenty resolutions taken by the Conference may be arranged under three heads: Constitutional, Archaeological, and Cartographical.

The first group calls upon the Governments represented and others interested to prepare and publish their material in consultation with the Bureau Central of the International Map, which will be advised by a Permanent Council of four members: Mr. O. G. S. Crawford, President; Dr. Bersu (Germany); Professor Lugli (Italy); and M. Seyrig (France). The International 1/Million Map will be the basis of the Roman Empire map, and the responsibility for each sheet will follow the same rule.

The second group of resolutions provides for the compilation of the relevant material in each country, its transmission through the Central Bureau to the country which undertakes publication, and agreement as to the limits of date; it approves the table of conventional signs, confirms the official name of the

Map to be borne at the head of each sheet, and requires that each sheet shall be submitted in draft or in proof to the criticism of the Permanent Council.

The resolutions of the third group are of special interest to geographers. They provide first that the name of each sheet shall be the same as the name of the corresponding sheet of the International Map, which may prove to be a little inconsistent with the next resolution, that the text shall be in Latin. Sheet N.30 is named Edinburgh, the most important name on the sheet, though on its extreme northern edge. But Edinburgh is not a Roman site, will not appear upon the face of the Roman Map, and would look odd in the title under the heading Tabula Imperii Romani.

The decision that the text should be in Latin was a happy solution of the always troublesome language question. The Paris resolutions (1913) of the 1/Million Map made its official title French, and required that this should be followed by a translation into the language of the producer: while if the conventional sign reference was not in one of three languages, it must be accompanied by a translation into one of those three, which is cumbrous and would be rather unnecessary upon sheets intended for an educated public. The Italian practice of providing with each sheet a pamphlet including a list of names, short commentary, and bibliography, afforded a happy solution. It was resolved that each sheet should have a pamphlet, in Latin, and in a language chosen by the country which published the sheet. Turkey, for example, might publish its pamphlet in Latin and Turkish: but might on the other hand do its neighbours the courtesy of publishing in Latin and French. If any other language than English, French, German, Italian, or Spanish is used, then the pamphlet must be translated also into one of those five, and its text will be trilingual. The pamphlet must contain also a translation of the Latin references on the map.

This excellent decision cleared the way for a consideration of the question whether something might be done to improve the design of the title, border, and references, and to grade the lettering on the map, which in the sheets already published gave no indication of the relative importance of Roman sites. So long as the references had to be bilingual nothing much was possible. But given the conciseness of Latin, much might be done, and a few sketches of borders submitted by one of the delegates had an unexpected success. The President of the Congress ruled that questions of design could not in the time available be considered in the full Commission, and the Permanent Council was charged with the duty of examining the question in consultation with the Central Bureau. The arrangement of the miscellaneous information thrown into the margins of the 1/Million Map without much attempt at design is no longer to be considered sacred and unchangeable. One may even hope that this decision will have repercussions on the design of the base map itself.

The functions of the Permanent Commission will be delicate, for they are charged with the duty of criticizing each sheet before publication. Experience has shown that it is hopeless to expect complete conformity to type in the products of different drawing offices and presses. Not even the office of origin can reproduce with any exactitude the layer colours of that masterpiece of colour printing, the *gamme* which accompanied the Resolutions of the Paris Conference of 1913. The printer of the Geographical Section, General Staff,

set a high standard; and there was much force in the remark of a French delegate that fine colour printing is a question of "economic chemistry." Nevertheless, a glance at published sheets shows that a good deal more might be done than has been done to make the colour scale conform to the original pattern. But apart from this delicate question of colour the Permanent Commission may be expected to control at any rate the more obvious divergences from type, such as the enormous title inset upon the provisional edition of the Tunis sheet, which wipes out the greater part of Tunis and Algeria altogether; or the sparseness of names on the Lyon sheet, which gives the effect that Roman Britain was far more highly developed by its conquerors than was Lyonese Gaul; or the mistranslation that has turned "Boundaries of the Augustan regions," which were internal divisions of Italy, into "Frontières a l'époque d'Auguste," and then back into English again as "Frontiers at the time of Augustus"; or the great divergences of procedure in the use of modern names, especially on the blue plate.

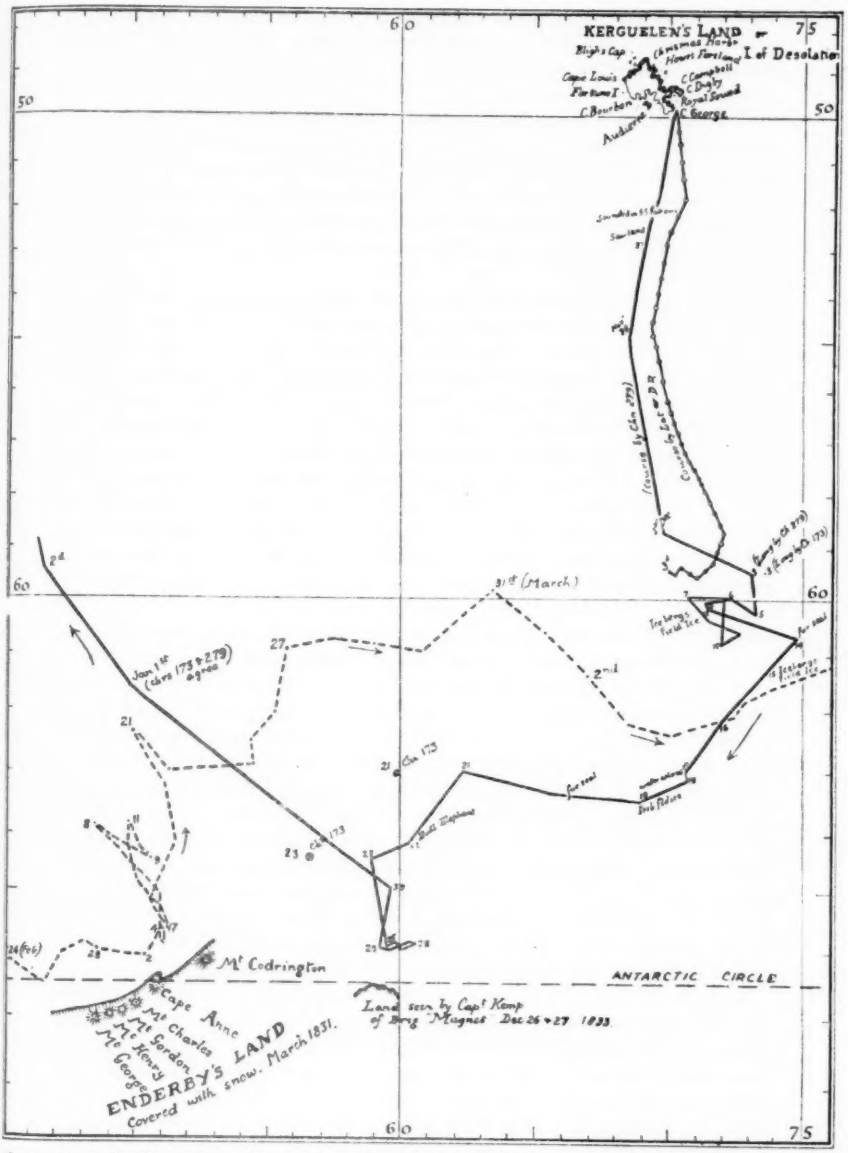
The Index Diagram presented to the Congress showed fifty-four sheets as contemplated, and three more were added at the Congress. Of these about a dozen have been produced, though some of this dozen are labelled provisional, and not all are yet on sale. One may be allowed to hope that the Permanent Council will find no difficulty in directing that such changes in the style and content as were accepted in principle by the Congress and left them to elaborate, may be adopted in all sheets as yet unpublished: and that the earlier published sheets may be eventually replaced by second editions of the new pattern.

SOME HISTORICAL FEATURES OF THE DISCOVERY OF ENDERBY LAND AND KEMP LAND

SIR DOUGLAS MAWSON

IN Biscoe's manuscript journal, which is in possession of the Royal Geographical Society,[1] he records that on 25 February 1831 "at 8 pm saw an appearance of land to the southward, with many ice-islands, field ice, and with much straggling pieces about us. . . . At noon our latitude was 66° 29′ S, longitude 45° 17′ E; that which lately had the appearance of land now bore from ESE to WSW (true bearing) . . ." This formation Biscoe then found to be an extensive ice mass bounded on the north side by sheer cliffs reminding him of the North Foreland of the Kentish Coast. It is evident from his description that he was then viewing the face of an extensive shelf-ice formation or possibly merely that of a gigantic tabular iceberg. However Biscoe further records that "it then ran away to the southward with a gradual ascent, with a perfectly smooth surface, and I could trace it in extent to at least 30 or 40 miles from the foretop with a good telescope; it was then lost in the general glow of the atmosphere." This description tallies with that of ice-covered Antarctic land fringed by shelf-ice.

[1] 'Antarctic Manual,' pp. 305–335.



A portion of a four-sheet chart of the world, 1833, with manuscript additions recording the voyages of Biscoe (broken line) and Kemp (continuous line), preserved in the Hydrographic Department, Admiralty.

In 1930, in the neighbourhood of the 45th meridian of east longitude, we found domed ice-capped highlands visible to the south when the *Discovery* was in a latitude differing only by a few miles from that of the *Tula* at noon on 25 February 1831. There is therefore no reason to doubt that the *Tula* was then within sight of the high land ice-cap lying to the south. The only matter for speculation is what has since become of the great ice-cliffs reported to be located so far to the north as to closely approach the position of the *Tula* as charted that day. It is possible that an extremely large flat-topped iceberg lay between them and the land-ice slopes; but it is equally probable or even more so that, in those days, a shelf-ice formation extended from the land so far to the north.

Just prior to the departure south of our British Australian New Zealand Antarctic Expedition in 1929, Lieut.-Commander R. T. Gould, R.N. (retired), drew my attention to the existence in the Hydrographic Department at the Admiralty of a manuscript chart showing the tracks of Biscoe and Kemp in the neighbourhood of what has since been called Enderby Land and Kemp Land. The reproduction of a tracing of this map is appended herewith. The original is part of a 4-sheet map of the World published in 1833, in which have been inserted in manuscript certain additions which constitute the most accurate known record of the discoveries of Biscoe, and the sole existing authority in connection with those of Kemp. In the reproduction of portion of the chart herewith submitted the island of Kerguelen is part of the original chart as published, whilst the remaining work is all manuscript. So far as ascertainable the latter is contemporary.

Referring to Enderby Land as here plotted it is to be observed that the coast-line indicated as having been sighted extends between the approximate limits of 47° and 53° east longitude. In the light of recent explorations we now know that the position in latitude which this plot assigns to the coast shown west of Cape Anne is many miles too far to the north. Looking across the belt of coastal pack Biscoe evidently misjudged the distance to the rising slopes of the land ice-cap lying to the south. This is not surprising as I was likewise deceived in 1930 when viewing that part of the Enderby Land coast from much the same position as did Biscoe one hundred years earlier. Between the 45th and 48th meridians the coastal ice-slopes are merely broadly undulating without any definite landmarks on to which sights can be taken for accurately locating its position. At the same time it is a notably elevated stretch of highland which, standing forth in the clear Antarctic air, suggests proximity though actually far distant.

In any case the evidence now to hand supports the view that Biscoe did first sight the Antarctic Continent near about the 45th meridian of east longitude. He was not himself sure of it however until a few days later when, in a position somewhat farther to the east, he first sighted some black mountain peaks rising above the land ice-cap. Then he "clearly distinguished it to be land." The claim for the extension of Enderby Land as far west as the 45th meridian is principally based upon Biscoe's observations.

The peaks marked on this manuscript map as Mount Codrington and that shown located at Cape Anne can be identified with certainty, but those indicated on the manuscript map as Mount Charles, Mount Gordon, Mount

Henry, and Mount George may be any of a number of peaks more recently charted as Mount Tula and the Scott Range.

Now coming to Kemp's voyage, a study of the track laid down in this manuscript chart is of quite special interest. In the first place it is to be recalled that Kemp's manuscript journal which appears to have been in possession of the R.G.S. for a brief period in those early years of the Society's existence, has disappeared without trace. All that is definite regarding Kemp's voyage is what appears on this manuscript chart.

Records at Trinity House supply some interesting particulars[1] regarding the *Magnet*, which was Kemp's vessel on the occasion of his notable Antarctic voyage. It appears that she was a small square-rigged vessel of 148 tons burthen, built at Dartmouth in 1815. The principal dimensions given are: length 71 feet, breadth between the main whales 21 feet 10 inches; two masts, standing bowsprit, square sterned, carvel built. Peter Kemp joined her in London as Master on 12 July 1833. She must then have sailed without delay to Kerguelen Island, departing south thence about November 25. Icebergs and fields of pack-ice were first met with in the vicinity of the 60th degree of south latitude. Antarctic land was sighted on December 26, but the track of the ship at that time indicates that she was held off-shore by a fringing belt of pack-ice and was unable to approach close to the coast. After four days spent on the pack edge in sight of land, Kemp set a course N.W. towards the Crozet Islands or Africa. On 13 June 1834 Kemp's engagement as Master of the *Magnet* was ended at the Cape of Good Hope. The vessel continued sealing and trading for some years. Her final port of registry was Sydney, and she was posted lost in the annual list of 1851.

The chart reproduced herewith illustrated the fact that Kemp was supplied with two chronometers which were not up to the present standard of reliability, for they not only disagreed but exhibited gross irregularity in this regard. Kemp's course as plotted is based, so far as longitude is concerned, upon chronometer 279. At several intervals a comparison of chronometers is noted by also marking on the chart the ship's position based on chronometer 173.

Recent explorations, having defined the coast-line of the land in the neighbourhood of Kemp's landfall, make it apparent that for the land margin thereabouts to be situated in the latitude indicated on Kemp's chart his vessel must have been located a degree or two farther to the west. In fact the longitude which was indicated by 173 and not 279 is the more correct.

One matter of great interest featured in this plot of the *Magnet's* track deserves special attention. This is the entry "saw land" made when proceeding south from Kerguelen in about lat. 52° 37′ S. Shortly before this observation is the notification that a sounding gave bottom at 55 fathoms. McDonald Island and Heard Island are both located in about latitude 53°, and these are the only lands in that neighbourhood.

The more reliable chronometer, 173, indicates a more westerly longitude than that of 279, which is that plotted in a solid line on the chart. Also the ship's track, according to dead reckoning, is situated still farther to the east.

[1] Information supplied in the year 1926 by J. B. Harrold of Trinity House to Lieut.-Commander R. T. Gould, R.N., when prosecuting investigations for the Hydrographic Department.

As the *Magnet* sailed south on a straight course from the southern entrance to Royal Sound under good weather conditions and was not more than two days out before the entry of "saw land" appears, one would expect the dead-reckoning position to be unusually accurate. The strong west to east drift of the surface waters thereabouts might indeed have drifted the vessel farther to the east than the dead-reckoning position given. Again, the 55-fathoms sounding indicated demands a more easterly position, for west of the line joining Kerguelen and Heard Islands the sea-floor rapidly deepens whilst on or near the direct course from Kerguelen to Heard Island shallow soundings may be got on a submerged bank.

The available evidence therefore indicates that the *Magnet's* course probably lay somewhat farther east than even the dead-reckoning track shown on the chart. The longitude by dead reckoning at the time of reporting land was just about that of the south-east entrance to Royal Sound, namely 70° 20′ E. of Greenwich (in the old chart figured herewith Kerguelen Island is plotted about 20 minutes too far to the west). The corrected dead-reckoning position of the ship therefore was about 70° 20′, which would be distant from Heard Island about 103 nautical miles and from McDonald Island about 78 nautical miles. Unless unusual mirage effects are conceded these distances are too great to be within sight from the ship. As already mentioned however the probability is that the *Magnet* was at the time drifted by the east-setting surface current farther to the east than the dead-reckoning position. As Heard Island reaches an elevation of about 7000 feet the summit should be visible on a clear day at a great distance.

In the face of the evidence of this chart with its shallow sounding and entry of the sighting of land in the latitude where land does exist, it would appear that Kemp really did sight Heard Island.

However the first sighting of Heard Island has always been credited to one Captain John J. Heard, master of an American merchant vessel *Oriental*, who, in November 1853, passed on the south side of the island with the land well within sight. The other small islands lying east of it, known as the McDonald Islands, were sighted in January 1854 by a British merchant captain of that name.

SCIENTIFIC RESULTS OF THE DE FILIPPI EXPEDITION TO THE KARAKORAM

SPEDIZIONE ITALIANA DE FILIPPI NELL' HIMÀLAIA, CARAcorùm e Turchestàn Cinese (1913–1914). Serie I. Geodesia e Geofisica: publicata sotto la direzione di Filippo de Filippi. Serie II. Risultati Geologici e Geografici. Vol. I. La Esplorazione della Regione fra l'Himàlaja Occidentale e il Carcorùm. By GIOTTO DAINELLI. xii+434 *pages. Bologna: Nicola Zanichelli* 1934. 12×9 *inches; illustrations and maps*

The Italian expedition to the Western Himalaya, Karakoram, and Chinese Turkestan organized by Dr. de Filippi was very fully equipped; the carefully selected party reached Bombay in August 1913, and, during the next twelve months, carried out its full pre-arranged programme of work. On the outbreak of the Great War, in August 1914, three of the party were recalled to Italy; consequently some parts of the exploration which were to have been undertaken during the long journey from the Depsang Plateau to Chinese Turkestan had to be left for future investigation.

The years of war and their aftermath prevented the immediate computation of the numerous observations and the study of the vast collection of notes and specimens garnered during the strenuous period of exploration. Consequently the publication of the Scientific Results was so greatly delayed that the first of these splendid volumes did not appear until 1923, and the last of the thirteen has only recently been published.

Some of the volumes have been reviewed already at length in the *Journal*. The publication of Vol. X. of Serie II. completes the whole series of Scientific Results and makes it convenient to give a general survey of the whole.

SCIENTIFIC RESULTS

The full account of the scientific observations and investigations, and of the subsequent computations and conclusions arrived at in the various fields of work, are contained in thirteen volumes divided into *two* Series.

SERIE I—GEODESIA E GEOFISICA

This series consists of *three* important volumes, prepared and published under the direction of Dr. F. de Filippi.

Vol. I. *Astronomia Geodetica, Geodesia e Topografia.*—Reviewed in the *Journal*, vol. 69, p. 156.

Vol. II. *Geofisica—Gravità e Magnetismo.*—This is the joint work of Comm. (now Admiral) A. Alessio and Professor G. Abetti, who were responsible for the observations of Gravity and of Earth Magnetism.

One of the main objectives of the De Filippi Expedition was to connect up the gravimetric work of the Survey of India with that of the Russian Geodetic Service. The equipment included a series of 8 pendulums, 4 from Italy and 4 from Potsdam (Sterneck's apparatus, somewhat modified). See Tav. I, at the end of the text. These delicate instruments required careful handling during the journey to the Upper Indus and onwards. See Tav. II. The instruments were carefully tested before starting and after their return to Genoa. In Asia, 14 stations had been selected: Dehra Dun, Srinagar; 7 in the Upper Indus Valley; 2 in the plateaus of W. Tibet; 3 in Chinese Turkestan. Plans and panoramic photographs indicate the exact position of each of the last 12 stations —Tav. III–XXXVIII. Tables of the actual observations at all the stations, and Tables of Comparative Results occupy the rest of this section.

The eventual computations prove that the gravity values are in excess in the Himalaya and the Karakoram themselves, and in defect in the regions to north and to south of them, thus corresponding to equal conditions of compensation or lack of compensation in the respective regions. The largest anomalies were found at Wazul Hadur (on the east flank of the Deosei Plateau), at Skardu, and at Tolti in the Indus Valley.

The applications and interpretations of the theory of Isostasy are dealt with in a monograph by Admiral Alberto Alessio. In the Preface he refers to certain criticisms of some of the deductions depending on the Theory of Isostasy, which he first published in a Supplement to the Rivista Marittima. In the *Journal*, vol. 63, p. 26, there is a paper by Dr. Bowie and a brief abstract of Alessio's contribution to the Rivista Marittima. These were read at an Afternoon Meeting of the R.G.S., and a discussion followed which, in the main, was adverse to Alessio's criticisms. He goes on however to remark, most courteously, that the Abstract failed to express "la precisa esposizione del mio pensiero," and did not give sufficient prominence to the mathematical argument on which his views are founded. Careful study of everything published on Isostasy up to 1929, and in particular of two articles by Professor Somigliana in *Rendiconti della R. Acc. dei Lincei*, vol. V (1927), pp. 11–119, and vol. VII (1929), pp.184–531, has not altered, but rather confirmed, his original criticisms. Admiral Alessio is convinced that, if mathematicians interested in Isostasy took the trouble to study the articles by Professor Somigliana and the Monograph in the original or in a faithful translation, the point of his criticisms would be understood, and that important modifications of some of the present views on Isostasy might follow. On this one can say only that English mathematicians who have studied the argument remain unconvinced.

In the section dealing with Earth Magnetism there is an account of the instruments selected for observing Magnetic Declination, Magnetic Dip, and Horizontal Force, and of the methods adopted and the formulae applied in each case. The stations chosen were the same as for Gravity observations, and most of this section is devoted to a series of Tables giving the actual observations at each station.

Between January 16 and 26, at Skardu, hourly observations were taken of Declination, and of Horizontal Force. When compared with synchronous observations taken at Dehra Dun, it was found that the variations were of similar magnitude in both places, but that at Skardu the variations took place with some retardation in local time. See diagrams pp. 211, 215.

The results were computed by Professor Mario Tenani and compared with those of D. C. Showers, of the Carnegie Institute, taken in 1909. It seems that the Secular Variation amounts to about $-3'$ yearly in the regions west of the Depsang Plateau and about $-2'$ on the plateau itself and in the regions to the north-east, while the Horizontal Force had diminished by about 36γ to the west of the Depsang, rather more to the north-east.

Vol. III. *Geofisica—Meteorologia, Aerologia, e Pireliometria.*—The text was written by Professor Camillo Alessandri based on the observations taken by Marchese Nello Venturi Ginori at Skardu, and by both these meteorologists at the other stations.

The programme included the usual series of observations of air temperatures, pressure, humidity, precipitation, wind-force and direction, all taken at frequent intervals, and also the Traces of Recording Instruments. The stations selected were Skardu, Leh, and the Depsang Plateau.

Skardu (Tables pp. 22–51) is situated at rather less than 7330 feet in a deeply entrenched basin traversed by the Upper Indus. On the N.E., the ground rises

abruptly to some 10,000 feet, while on the S.W. it slopes more gradually to the Deosei Plateau.

The observations were continuous from 1 November 1913 to 14 February 1914. In the first half of November maximum shade temperatures often reached 55° F., the minima often falling to 10° F., and once almost to 0° F. The coldest period was in January, after which the temperature began to rise.

The most striking features were the low humidity and the absence of wind. Calms were recorded on 87 of the 106 days; on 15 days slight air movements from the S. or S.E.; and on the other 4 a fitful wind from the N.E. Though clouds were often visible over the high ground on either side, immediately overhead the sky was either clear or veiled by a filmy haze, which almost always dispersed at night.

There was no precipitation until December 10, when there were slight scurries of snow, and there were others at intervals in the next few weeks, but the powdering of snow soon sublimated into the dry air. Snow fell and remained lying on only 4 days, the heaviest fall being on February 13–14, when the low ground was covered by about 5 inches of snow. Similar conditions are characteristic of other intermont valleys, *e.g.* in British Columbia.

Leh (Tables pp. 54–85), at about 11,540 feet above sea level, lies on the northern edge of a wide sandy plain which rises steeply to the N.E. and S.W. The Indus meanders over the plain, enclosing many small islands clothed with low trees and shrubs.

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The average mean shade temperature in January is 17° F.; in July 61° F., but the average diurnal range is stated to be no more than 12° F. This curiously small range is due to the permanently clouded sky, for, on the rare occasions when the sky is clear at night, the range is greatly increased. In the open, sun temperatures are very high, for, apart from the reflected heat from the clouds, there is intense radiation from the high rock walls.

The air is always intensely dry, and full of dust, blown hither and thither by the strong, gusty afternoon winds, which are very variable in direction.

The Depsang Plateau (Tables pp. 88–163) formed the main headquarters from June 1 to August 16, and during this period the same meteorological elements were registered, but at more frequent intervals.

This plateau covers an area of nearly 400 square miles, and its elevation varies from 17,400 to 18,050 feet. It is well defined however because it is surrounded by much higher ground, except in one place towards the north, where the small streams draining the plateau have joined to form the Chipchap river, which there breaks through the barrier.

In June fair and stormy days were equally distributed, but in the next six weeks bad weather predominated, with frequent and most unpleasant sleet showers. In the open, on fine days, the heat was blistering, though shade temperatures rarely rose above 42° F., while at night, under cover, the thermometer often marked 15° F., and even less.

The most remarkable feature was the great variation in wind-force and direction. As the sun rose, a light breeze began from the E.; as the day advanced, the air movement increased hour by hour until in the early afternoon it began

The eventual computations prove that the gravity values are in excess in the Himalaya and the Karakoram themselves, and in defect in the regions to north and to south of them, thus corresponding to equal conditions of compensation or lack of compensation in the respective regions. The largest anomalies were found at Wazul Hadur (on the east flank of the Deosei Plateau), at Skardu, and at Tolti in the Indus Valley.

The applications and interpretations of the theory of Isostasy are dealt with in a monograph by Admiral Alberto Alessio. In the Preface he refers to certain criticisms of some of the deductions depending on the Theory of Isostasy, which he first published in a Supplement to the Rivista Marittima. In the *Journal*, vol. 63, p. 26, there is a paper by Dr. Bowie and a brief abstract of Alessio's contribution to the Rivista Marittima. These were read at an Afternoon Meeting of the R.G.S., and a discussion followed which, in the main, was adverse to Alessio's criticisms. He goes on however to remark, most courteously, that the Abstract failed to express "la precisa esposizione del mio pensiero," and did not give sufficient prominence to the mathematical argument on which his views are founded. Careful study of everything published on Isostasy up to 1929, and in particular of two articles by Professor Somigliana in *Rendiconti della R. Acc. dei Lincei*, vol. V (1927), pp. 11–119, and vol. VII (1929), pp.184–531, has not altered, but rather confirmed, his original criticisms. Admiral Alessio is convinced that, if mathematicians interested in Isostasy took the trouble to study the articles by Professor Somigliana and the Monograph in the original or in a faithful translation, the point of his criticisms would be understood, and that important modifications of some of the present views on Isostasy might follow. On this one can say only that English mathematicians who have studied the argument remain unconvinced.

In the section dealing with Earth Magnetism there is an account of the instruments selected for observing Magnetic Declination, Magnetic Dip, and Horizontal Force, and of the methods adopted and the formulae applied in each case. The stations chosen were the same as for Gravity observations, and most of this section is devoted to a series of Tables giving the actual observations at each station.

Between January 16 and 26, at Skardu, hourly observations were taken of Declination, and of Horizontal Force. When compared with synchronous observations taken at Dehra Dun, it was found that the variations were of similar magnitude in both places, but that at Skardu the variations took place with some retardation in local time. See diagrams pp. 211, 215.

The results were computed by Professor Mario Tenani and compared with those of D. C. Showers, of the Carnegie Institute, taken in 1909. It seems that the Secular Variation amounts to about $-3'$ yearly in the regions west of the Depsang Plateau and about $-2'$ on the plateau itself and in the regions to the north-east, while the Horizontal Force had diminished by about 36γ to the west of the Depsang, rather more to the north-east.

Vol. III. *Geofisica—Meteorologia, Aerologia, e Pireliometria.*—The text was written by Professor Camillo Alessandri based on the observations taken by Marchese Nello Venturi Ginori at Skardu, and by both these meteorologists at the other stations.

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The most remarkable feature was the great variation in wind-force and direction. As the sun rose, a light breeze began from the E.; as the day advanced, the air movement increased hour by hour until in the early afternoon it began

to blow hard, with gusts reaching almost gale force, while the directions passed through all compass points to W. Towards sunset the wind moderated and at nightfall there was always absolute calm, which continued until dawn. Pilot balloons showed that similar conditions held up to some 5000 feet above the plateau, but at greater elevations the wind-directions indicated clearly the influence of the S.W. Monsoon, for the direction varied between S. and W., with a preference for S.W.

The rest of the volume deals with four topics:

A. Tables of meteorological records from three stations on Monte Rosa (pp. 168–307), required for ascertaining the influence of altitude in connection with Laplace's formulae for correcting Barometric readings.
B. Diagrams (pp. 311–320) of the tracks of Pilot balloons.
C. The Intensity of Insolation, and the Solar Constant, as measured at various stations with two Angström Pyrheliometers (pp. 333–357).
D. Summaries and discussion of results, from p. 343 to the end.

SERIE II. RISULTATI GEOLOGICI E GEOGRAFICI

This Series, published under the direction of Professor Giotto Dainelli, comprises ten volumes of "Results," and two others still in preparation, Vol. XI, Appendices, Vol. XII, Analytical Index.

Vol. I. *La Esplorazione della Regione fra L'Himàlaia Occidentale e Il Caracorùm.* —For English students, unable to read Italian, the great value of this book lies in the exhaustive Bibliography (pp. 373–425); in the eleven large-scale route-maps and wonderful panoramic views at the end of the volume; and, lastly, in the map on the scale of 1 : 750,000, in four sheets, contained in a pocket on the inside of the cover. This map is a most graphic representation of the whole region, relief being shown by form-lines with oblique hill-shading. All the known glaciers in the Western Himalaya and in the Karakoram are clearly indicated, and, as only a few carefully selected place-names are printed, the general effect is most artistic. Of special importance to the student are the red lines showing the routes followed by all those who have visited any part of this region, and therefore the positions of all the passes into and out of the Upper Indus Valley.

The Italian text, though falling to the share of Professor Dainelli, bears eloquent testimony to the immense amount of research accomplished by Dr. de Filippi while preparing for publication the account of the expedition conducted by the Duke of the Abruzzi to the Baltoro glacier in 1909. Intensive study of this mass of literature revealed many unsolved problems in connection with this region, and that the whole field of geology, of glaciology, of ethnology, and of other branches of Science still awaited systematic exploration and investigation. Thus was laid the foundation of the whole scheme of work to be carried out in the far more ambitious expedition of 1913–14.

Even as late as 1800 practically nothing was known to Europeans about the great mountain region in which the Indus, the Sutlej, and the Ganges have their sources, for the extensive travels of the Jesuit missionaries had been kept secret and have only recently become available. Professor Dainelli traces out the gradual unveiling of this unknown region in chronological order, describing concisely the more important journeys, illustrating them by separate sketch-maps, and critically examining the results attained by each.

The first of these accounts is the diary of Mir Izzet Ullah, 1812 (p. 17), then the journeys of W. Moorcroft, 1820–23 (p. 20). Of special interest, from the scientific standpoint, are the expeditions of the three Schlagintweit brothers,

1856–57 (pp. 76–86), and the arduous labours of the officers of the Great Trigonometrical Survey of India who carried the Indian Triangulation from the Punjab, through the Vale of Kashmir, into the valley of the Upper Indus to Leh, and onwards into Western Tibet, 1857–63 (pp. 93–99).

In the next thirty years, knowledge of the region became more and more definite. The numbers who visited parts of it in various capacities, geologists, botanists, ethnologists, sportsmen, officials on mission, are so considerable that it is not possible to mention them in a short review.

A new field of activity, that of Alpine climbing, was initiated by W. M. (later Sir Martin) Conway and C. G. Bruce in 1892, when they examined the great glaciers of the N.W. Karakoram (pp. 192–197 and 204–206). In 1909 there were two important expeditions—that of the Duke of the Abruzzi, primarily to reach the summit of K2 (28,250 feet). This proved to be inaccessible from the highest point attained (25,580 feet), yet valuable information was obtained of the great Baltoro glacier, illustrated by Signor Sella's photographs (pp. 247–250); and that of Longstaff, Slingsby, and Neve to the glaciers of the Nubra valley. Longstaff had the honour of discovering the Siachen glacier, the greatest of all the Karakoram ice-fields (pp. 247–254). The next five pages contain an interesting sketch of the journeys made by Dr. Neve during his thirty years as medical missionary in Kashmir.

Limitation of space necessitates many omissions, here and elsewhere, and we pass on to a brief summary of the De Filippi Expedition. Topographically, the most important result was the discovery, made by Major Wood, that the central headstream of the Yarkand River had its source in a northern extension of the Rimo glacier, so that the main divide of the Karakoram Range must be placed some 22 miles farther to the west than had previously been supposed (see Map, Tav. XLI).

Events in Europe put an end to organized Alpine expeditions, and these were not resumed until the Visser Expeditions, 1922, 1925, and 1929–30, the two last being of considerable importance (pp. 308–314). In 1926 came Major K. Mason's expedition (pp. 300–304). The objective was to follow the valley of the Shaksgam from its glacier sources. Though he verified de Filippi's discovery of the true position of the Karakoram Divide, physical obstructions prevented any advance downstream in the time available, consequently he and his party turned north into the complicated Aghil Ranges, where a most important survey was carried out. The preliminary map (*Journal*, vol. 69, facing p. 384) definitely represents the Shaksgam River (one of the main western headstreams of the Yarkand River) with sources in the northern extensions of the Rimo, the Siachen, the Urdok, and the Gasherbrum glaciers.

In 1929 the Italian expedition of H.R.H. the Duke of Spoleto reached the Baltoro glacier from Skardu by the Shigar valley, a much shorter route (pp. 314–317). The party of scientific observers separated into small groups, one of which came into the upper Shaksgam valley at the western side of the Kyagar glacier-snout—the eastern side of which had been reached by Mason. The full account of the results has not appeared, yet the connection between the Shaksgam and its glacier sources is now considered to be sufficiently proved to be represented on Sheets I and II of the Map in the cover-pocket of this volume. The last fifty pages contain a summary of Professor Dainelli's individual journeys during 1913–14 and also in 1930.

Vol. II. *La Serie dei Terreni*.—This volume, on the Geological Structure of the Karakoram and the Upper Indus Valley, gives details of Professor Dainelli's investigations in the area covered in his numerous excursions from the three main headquarters. In these accounts he makes light of the hardships of his

winter travels, but generously acknowledges what he owed to his companions, and especially to the writings of his geological predecessors, whose names will be found in the full Bibliography at the end of the volume.

He traced the limits of the Palaeozoic, Mesozoic, and Tertiary formations, and located masses of intrusive plutonic and igneous rocks in parts which had hitherto received little attention, giving full reasons for accepting or rejecting earlier work. The illustrative photographs and the accompanying map are admirable.

The last edition (1934) of Burrard and Hayden's 'Sketch of the Geography and Geology of the Himalaya Mountains and Tibet' has a new geological map in which Dainelli's work is incorporated, and in the text are several references to his work.

Vol. III. *Studi sul Glaciale.*—This was reviewed in the *Journal* (vol. 63, p. 243) by Professor E. J. Garwood.

Vol. IV. *Le Condizioni Fisiche Attuali.*—The present physical conditions are here described by Professor Dainelli and his colleague the late Professor Olinto Marinelli, and their discussion forms the subject-matter of *four* monographs.

The first monograph (pp. 7–62) is entitled *Catalogo dei Ghiacciai del Caracorum*, but it is far more than a mere list of glaciers. The first objective of the joint authors was to ascertain the extreme length of each main glacier from crest to snout, and to measure with a planimeter the area of its basin, as represented on the best maps available. Consequently, each main glacier is fully described in the order of geographical position, starting with the Hispar glacier in the extreme north-west. All available information on the position and altitude of the snouts, and of the crests limiting the basins, is assembled in the text and critically examined, in connection with all the published maps. The authors found it necessary to construct new maps of eleven of these glaciers (see Tav. I–XI, at the end of the volume). The Table on p. 54 summarizes the results of this labour. The twenty main glaciers are arranged in the order of extreme length. Certain measured details are entered in the columns, including the total area of each basin, given in square kilometres. Students may be reminded that 1 km. = 0·38611 sq. m., so that the area of the Siachen glacier is practically 600 sq. m.—the largest glacier out of the Polar Regions.

The second objective was to devise some means of representing graphically the relation between the areas of permanent snow and ice and those that are uncovered, *e.g.* peaks and steep slopes. Using the latest maps of the Indian Topographical Survey, corrected where necessary and excluding all glaciers feeding the Yarkand River, the authors split up the whole area between the Main Divide of the Karakoram and the valleys of the Upper Indus and its tributaries into ninety-two zones, each defined by the minor divides. The total area of each zone was measured, and also the area under permanent snow and ice. The results are tabulated on pp. 58, 59. The total area of each zone may be accepted as substantially accurate, but, for obvious reasons, "the glacial areas" are only approximately correct. The total number of the glaciers, large and small, is given as 526, a number which they consider may eventually be somewhat increased. Column 2 of the Table states the general exposure of each zone; Column 6 gives the percentage of the "glacial" area. Tav. XII shows the variation in glaciality, *i.e.* the ratio between glaciated and non-glaciated areas, expressed as a percentage, and these are indicated graphically by isopleths and tints of blue, while, in the text, certain features brought out by this representation are fully discussed.

The second monograph, *Limiti delle nevi attuali e nel Periodo Glaciale* (pp. 65–215), begins with an exhaustive study of the reports on the limits of

permanent snow in the Alps, so as to formulate some general method of attacking the problem of fixing the approximate mean altitude of the snow-line. Various suggested methods are criticized before passing on to the Asiatic Region; here, too, the investigations of previous glaciologists are carefully examined and combined with those of the De Filippi Expedition. The method finally adopted was a continuation of the planimetrical measurements recorded in the first monograph. These included (*a*) the determination of the mean altitude of each of the glaciated areas, and of the peaks and crests; (*b*) the measurement of the total area of each *névé;* (*c*) the fixing of the average direction of exposure to air movements. The conclusions drawn by the authors are illustrated in Tav. XIII, on which the limits of snow are shown by hypsometric curves at intervals of 250 m. (820 feet).

The last eight pages deal with a comparison of the present limits with those probable during the Glacial Period.

The third monograph, *Caratteri dei Ghiacciai del Caracorùm* (pp. 215–397), is concerned with a number of allied glaciological topics.

(1) *Types of glaciers* (pp. 215–237).—All the suggested classifications of Alpine glaciers are criticized in detail. The joint authors, relying on their wide experience of both Alpine and Asiatic glaciers, reduce the number of types to a minimum, since the differences are due to the action of *morphological* factors, such as altitude and the surface features of the parts underneath the upper and the lower glaciated parts, and of *climatic* factors, which control the snowfall, its distribution and intensity of melting. They maintain that the peculiarities of all glaciers are traceable to the influence of these two sets of factors.

One interesting note suggests that the erroneous statements about these glaciers to be found in most text-books on Physical Geography are probably due to very imperfect representations of glacier-shapes in the "Indian" maps. They remark that the office draughtsmen are natives who have never seen a glacier, and therefore derive from text-books certain conventional ideas on these shapes. These ideas are reflected in the marked uniformity of the map representations, which are most misleading in view of the manifold differences in character.

(2) *Snow supply; speed of movement; intensity of fusion* (pp. 237–250).—No thoughtful student who has formed a true impression of the great altitude and the immense breadth of the mountain belt of the Central and Western Himalaya intervening between the Karakoram and the southern sources of water-vapour, can fail to be astounded that these interior glaciers should be of such vast extent. The explanation seems to be as follows: (*a*) *Snow supply*. The two maps reveal the connection between altitude and glaciality (Tav. XII and XIII). Since most of the glaciological expeditions have been confined to the summer and autumn, there is little available information even on the months of maximum precipitation, still less on the total amount. Yet there must be a short period of relatively considerable snowfall, and there is evidence that the quantity is never great, and that it varies widely in different years. Two sets of factors however control the distribution of the snow: (i) *morphological* factors, viz. the great altitude of the *névés*, their great depth and length, and the extent of the steep rock masses protruding to great heights above the collecting grounds; and (ii) *climatic* factors, which cause the falling snow to be extremely powdery, and the surrounding air to have an extremely low humidity. Descriptions by many reliable observers may be summarized as follows: The wind drives the tiny particles of snow with great violence against the lofty rock faces, causing great accumulations. Eventually the weight becomes so great that tremendous avalanches of partially compacted snow are precipitated on to the surface of the *névés*, thereby displacing great clouds of dry powdery snow. These clouds

sublimate into the air, forming water-vapour, and no doubt increase subsequent falls of snow. These avalanches are so frequent, and bring down such great masses of additional snow, that the effect of the summer sun, neutralized by the intensely low night temperatures at those altitudes, does not greatly diminish the total amount. The resulting glaciers alone prevent a steady increase in the depth of the *névés*. (*b*) *Speed of movement*. Comparison of the many careful measurements of the larger Alpine glaciers indicates that their average speed is in the neighbourhood of 20 yards a day. Though accurate measurements on the Asiatic glaciers are few, they support other evidence adduced by the authors and lead them to the conclusion that the average speed cannot be less than 50 yards a day, and is probably more. (*c*) *Intensity of surface melting*. All visitors to the Karakoram have remarked on the large amount of water to be found during the day time on the surface of the lower parts of the glaciated areas. Even on the flatter parts near the throats of the *névés* large shallow expanses of water are often seen. On the glaciers themselves, even in the upper parts, numbers of rushing torrents are found, which unite to form considerable streams, in some places as much as 30 feet wide and equally deep, and therefore seriously impede progress during the day. Farther down the glaciers, the depth of the water-eroded channels is most impressive, while, on the parts protected by masses of debris, there are no surface streams, but the general level steadily lowers as the summer progresses. Direct observation on the snout of one glacier proved that its height had diminished by at least 30 feet in just under three months.

(3) *Ice pinnacles—their distribution and origin* (pp. 250–282).—There are many descriptions of these curious sharp-pointed pyramids of clear ice projecting from the surface of the moving glaciers. They are to be found in all parts of the Karakoram, but they are far more abundant on some glaciers than on others. The pinnacles differ greatly in height, from some 10 feet or rather less to as much as 50 feet, and occasionally they rise much higher. The upper limit of their occurrence is about 1600 feet below the snow-line and where the slope of the glacier begins to flatten; from there to the snout they are found in greater or less numbers. In these particulars they differ from the *séracs* of the Alps, and from the *nieves penitentes* of the Southern Andes, which are restricted to the lower parts of the *névés*. The authors point out differences in the arrangement of these pinnacles: (*a*) on glaciers without median moraines, the pinnacles are scattered irregularly over the whole ice surface, and vary considerably in height; (*b*) on glaciers with surface debris on the central parts, the pinnacles are only on the parts where the ice is clear, and there they occur in long lines, following the direction of the glacier flow. Each line is separated from the next by deep channels eroded by running water, while the heights of the peaks in the lines are noticeably similar. The same peculiarity is found on the snouts—on those where morainic matter is prevalent there are few pinnacles, on those which are mostly clear ice the number is great.

The origin of these pinnacles cannot be attributed to lateral pressure, as suggested by one writer, but must be sought in the effects of intense insolation on the two types of glacier surfaces—that which is mostly clear ice, and that which is covered with morainic matter. The latter, owing to the protection, melts more or less evenly, keeping a relatively even surface as it steadily lowers, whereas the former shows the effects of melting in the deep water-eroded channels, between which the ice has remained outstanding, in long, narrow lines, divided transversely by the effects of unequal exposure to insolation.

The peculiarities of the glaciated area in the Karakoram, and their causes, seemed of such importance that most of the available space has been devoted to their consideration. Hence, for purposes of reference, the other interesting

topics discussed in the remainder of the third and the whole of the fourth monograph are confined to a mere list.

(4) The zone of "pozzette," *i.e.* small cavities in the ice partly filled with water during the day. *Cf.* the "baignoirs" or "gouilles" of the Alps (pp. 282–288).
(5) Superficial and terminal moraines (pp. 288–309).
(6) Glacial lakes (pp. 310–318).
(7) Characteristics and oscillations of the snouts (pp. 318–379).
(8) Glacier dams (pp. 379–397).

Fourth monograph: *Di alcune particolari condizioni fisiche nella Regione considerata.*

(1) Valley floors and areas which have been glaciated (pp. 401–409).
(2) Hot springs and their distribution (pp. 409–431).
(3) Salt pits, and other cavities in fluvial alluvium (pp. 431–439).
(4) Masses of finely divided mud (Conway's mud avalanches) (pp. 439–445)
(5) Peculiar forms of erosion due to water and weathering (pp. 445–454).

Most of the features discussed in the four monographs are admirably illustrated by a large number of excellently selected photographs (Tav. XIV–LXVIII).

Vol. V. *I Fossili del Palaeozoico.*

Vol. VI. *I Fossili del Mesozoico e Terziario.*

In both volumes there is a full bibliography, and Professor Dainelli describes most of the fossils which he collected, indicating the locality of each. In Vol. VI there is an interesting sketch-map showing the distribution of land and sea in Eurasia during the Lower Oolite period.

At the end of each volume will be found representations of the more remarkable specimens, and some excellent photographs of the rock exposures where fossils were abundant.

Vol. VII. *Le Rocce.*—Professor Piero Aloisi describes in detail the characters of the large collection of igneous and metamorphic rock specimens sent home by Professor Dainelli, mentioning the localities where each was found. Then follow seven plates of thin rock slices viewed by polarized light and photographed direct.

Vol. VIII. *Le Condizioni delle Genti.*

Vol. IX. *I Tipi Umani.*

These two volumes were reviewed in the *Journal* (vol. 68, p. 257).

Vol. X. *Raccolti di Pianti e di Animali.*—This volume contains (1) a Monograph by Professor R. Pampanini on the Karakoram flora. The bibliography indicates that the account includes the work of all previous botanists in the region. Several new plants and flowers were collected by members of the expedition, and these are illustrated by photographs. (2) A description, by Professor D. Vinciguerra, of the curious fish caught in the Indus and its tributaries.

Separate from the volumes of the Scientific Results two other books were written:

1. *Storia della Spedizione Scientifica Italiana nell' Himàlaia Caracorùm e Turchestan Cinese* (1913–1914).—This general account of the work of the expedition was written by Dr. de Filippi and appeared in 1923. It was reviewed in the *Journal* (vol. 66, pp. 254–257).

An English translation was published by Edward Arnold & Co. in 1932. In the Preface Dr. de Filippi states that he had revised the original Italian text, adding a new chapter, in which he gives a summary of the scientific results in the various fields of research, and also a concise account of the work done in these regions during the eight years since the book was published, and especially

those of Professor Dainelli's independent journey in 1930, and those of Major K. Mason in 1926. This admirable translation, with profuse illustrations, is indispensable to those who desire to form a true impression of the characteristics of Kashmir, Western Tibet, and Chinese Turkestan.

2. *Paesi e Genti del Caracorum—Vita di Carovana nel Tibet Occidentale.*—Professor Giotto Dainelli himself has here given a fascinating description of the whole region which he explored in the course of his many separate journeys from the various headquarters of the main expedition. It was published in two volumes in 1924, and was briefly reviewed in the *Journal* (vol. 68, p. 257).

B. B. D.

REVIEWS

EUROPE

ALTE DEUTSCHE LANDKARTEN. By EDGAR LEHMANN. *Leipzig: Bibliographisches Institut* 1935. 7×5 *inches; 52 pages; maps.* 90 *Pf.*

This delightful little book forms one of Meyers' series of *Bunte Bändchen* and is appropriately illustrated by more than a dozen excerpts from old regional maps of Germany, many of them in colour. That the author is fully alive to all that pertains to his subject-matter is evidenced by the inclusion of the interesting and unique little Nuremberg road-map (dated about 1500) which recently changed hands in London. In the compass of fifty pages or so it is scarcely possible to give a complete history of the map, but Dr. Lehmann has in mind the general reader and the connoisseur rather than the specialist, and his sketch of the progress of cartography in Germanic lands during the sixteenth and seventeenth centuries is well-balanced and wholly admirable. A work on a similar modest yet adequate scale for the amateur of old English maps is unfortunately wanting: we have, it is true, several valuable memoirs and bibliographies, but these are alike too specialized and too costly for the general reader, who wishes merely to know something about the cartographers, the dates of the important editions, and the explanation of the characteristic features of early maps. E. G. R. T.

YACHT CRUISING ON INLAND WATERWAYS: from the Baltic to the Mediterranean. By Captain C. E. A. L. RUMBOLD. *London: Oxford University Press* 1935. 8×5 *inches;* x+200 *pages; illustrations and maps.* 12*s* 6*d*

The Oxford University Press has already published several yachting books by writers of outstanding authority, and the present volume is a worthy addition to the series by an author with an unsurpassed knowledge of the branch of which he treats. The inland waterways with which Captain Rumbold deals comprise not only those of France whereby motor yachts may reach the Mediterranean, but also the Belgian and Dutch canals, estuaries, and sheltered seas which afford cover for most of the distance to Kiel and the Baltic. Two of the chapters indeed describe a cruise to the Baltic by way of the Kiel Canal. Virtually all the routes described, except those through France, are available for sailing craft with fixed masts. The book is thus not limited to the interests of the motor yachtsman. Of the two craft fully illustrated and described in it, one is a motor yacht of 37 tons T.M. and the other an auxiliary cutter of 17 tons.

The author has long cruising experience in both types, and his book is full of useful advice and properly detailed information. When speaking of obtaining charts, supplies, and regulations in foreign countries he invariably gives the full postal address to which recourse must be made. Detail of this sort makes all the difference to the practical value of advice, and also, it may be added, to the pains taken by the writer in producing the book. Geographical data of importance to the yachtsman are abundant: the speed of the current in the Rhine and the Rhône, the winter freezing of canals in central France, the depth of the various waterways (many people, he says, do not realize that a sailing cruiser drawing 5½ feet or even more can negotiate most of the Dutch routes). About the design and fitting of boats the author has firm views which may profitably be weighed by prospective owners. In general it may be said that this is a book which will many times repay its cost to any one contemplating such cruises as those it describes and which is also full of ideas and sound advice for those who do not "go foreign" with their boats. J. A. W.

DER SPESSART: eine landeskundliche Studie. By JÜRGEN SIEBERT. *Breslau: Ferdinand Hirt* 1934. 9½×7 *inches; 164 pages; illustrations and maps. M.6*

Of all the English travellers who visit the Black Forest, the Odenwald, or the Eifel how few ever penetrate the Spessart? It is some consolation to read that it is an "unknown" part of their country to the majority of Germans also, but it is doubtful how long it will remain unknown if this book enjoys the popularity which it deserves. This delightful little work provides the traveller, including of course the fireside traveller, with just that understanding of the landscape and the life of the people which quickens the powers of observation and deepens the interest, so that the region is transformed from just another place to look at into an area with a vivid personality, worthy of attention not only on account of its dark woodlands, its sunny valleys and its general air of "quaintness," but on account also of the long history of natural and human forces which have moulded it to its present form.

The book begins with a short account of the limits and the physiognomy of the Spessart. It continues with a clear description of the physical landscape, in other words the influence of the geological structure and the composition of the rocks on relief forms, a study which is aided by the excellent photographs and diagrams. The rest of the book is devoted to the evolution of the cultural landscape, in which the author deals with the types of settlement, the importance of the chase in olden days, the mediaeval glass, iron, and mining industries, the extension of cultivation, and the present utilization of the land, including the management of the forests. Dr. Siebert pays throughout close and sympathetic attention to the part played by the human element, in fact the whole work is human geography at its best. Written in a clear, flowing style, without stiffness or pedantry, it has much of the artistry associated more with the French school of geographers than with the German.

The production of the book also leaves nothing to be desired, with perhaps the exception of the Gothic print, which even at its best and clearest is apt to melt upon "the dazzled sight." The forty-eight photographs are not only beautiful in themselves but really illustrate the author's argument. It might however be found worth while to supply an index when a second edition is called for. It may be added that nothing on the lines of the semi-popular regional monographs now appearing in Germany has been yet attempted for any of the regions of the British Isles, which have seldom been treated in any manner between the purely academic and the merely superficial. Dr. Siebert's little masterpieces might well serve as a model, and it is possible that the supply would reveal a demand.

M. R. M.

ASIA

KING FAISAL OF 'IRAQ: An Authorised and Authentic Study. By Mrs. STEUART ERSKINE. *London: Hutchinson & Co.* 1933. 9½×6 *inches; 288 pages; illustrations.* 18*s*

This study does not claim to be a serious contribution to Biography. In the author's Preface Mrs. Steuart Erskine is careful to warn the reader that her object is not to present "a full and definitive life of King Faisal," but on the entry of 'Iraq into the League of Nations, to give some account of the man under whose guidance the country had progressed towards freedom. It would, therefore, be out of place to criticize the historical inadequacy of the story as told by the author. On the other hand, if the book is to be regarded as the impressions of a visitor to Baghdad during the last year of the King's life, coupled with a background of selections from writers with first-hand knowledge, it is difficult

to understand why the volume should have been burdened with the full text of the Mandate, and a long dissertation on the origin of the Baghdad Criminal and Procedure Codes which were introduced some years before Faisal appeared on the scene. That the book should contain a chapter on Air without any mention of the part played by Air Control in the administration of the government, and a chapter on Oil without any description of the financial advantage accruing to the new State from the 'Iraq Petroleum Company's concession, is evidence that the author's impressions were superficial in the extreme; and the passing reference to the latter subject on p. 250 shows that the important bearing of this subsidy on the revenue of the country was not understood.

The descriptions of the King himself and his surroundings are vivid and attractive, and the selections from Lawrence and the Letters of Gertrude Bell are particularly well chosen. The most interesting feature of the book is the statement of the Arab claims and of his own expectations and experiences given to Mrs. Steuart Erskine by Faisal himself; but it is a pity that the interviewer was not better equipped by personal familiarity with the subject to elicit from the King some answer to the interpretation placed by the British Government on their pledges to the Arabs, and some idea of the practical means which he would have adopted to establish an Arab confederation if he had been given a free hand. How, for example, would he have secured cohesion or provided for finance and defence? The mere statement of aspirations is of little value in itself.

In the circumstances it is not surprising that there are a number of mistakes (such as the name of the Shah twice given incorrectly and the date of signature of the First Treaty given differently on pp. 155 and 158) which cannot be attributed solely to the carelessness of the printer. The photographs are good; but in the reviewer's opinion there is no portrait that has ever done justice to King Faisal's charm and dignity. N. G. D.

PALESTINE: the Enchanted Land. By JOSEPH PERRY. *London: The Epworth Press* 1935. $7\frac{1}{2} \times 5$ *inches;* 160 *pages; illustrations and sketch-map.* 3*s* 6*d*

In the Foreword this book is very fairly described as "the impressions of one who, making no claim to scholarship and caring little for the investigations and discussions of the specialist, saw just what we might have seen if we, with no particular preparation for such a journey, had suddenly escaped from a life of toil in the Black Country to the hillsides of Judaea." The tour, a very ordinary one, included besides Jerusalem, a visit to Hebron, Bethlehem, and Transjordania, but there is disappointingly little description of the places seen or of their historical associations. The chapters read like letters addressed to a Sunday school class. Not many travellers would describe Tel Aviv as the loveliest place in the whole coast. Jaffa boatmen and officials are not, as stated, largely Greeks. To describe the so-called "Pool of Hezekiah" as "a reservoir of water supplied from a spring some distance on the way to Gaza called to-day Birkeb Mamilla" is a strange mis-statement. E. W. G. M.

IRAQ, from Mandate to Independence. By ERNEST MAIN. *London: George Allen and Unwin* 1935. $9\frac{1}{2} \times 6$ *inches;* 268 *pages; illustrations.* 16*s*

The members of the British public interested in Iraq have already had good reason to be grateful to Mr. Ernest Main for timely applications of cold fact to the heated controversies surrounding the establishment in Baghdad of an independent monarchy. His new book is therefore to be welcomed; and the headings of the chapters in themselves show that it is a complete statement of the facts from every aspect, international, historical, political, and economic. The author, who has been an observer on the spot, unbiassed by any official or commercial

predilections, is exceptionally well qualified to make such a statement. From this point of view the work has been admirably done; and if it is a little difficult sometimes to see the wood for the trees, at least the reader will be able to judge the issues raised by the termination of the Mandate in their due proportions.

For example, no undue prominence is given to the problem of the Assyrians. However deeply the British people must sympathise with the sufferings of this small, gallant, and homeless people, an unbiassed statement of the facts shows that, apart from one incident, the sufferings of the Assyrians cannot justly be attributed to the Iraqis or their Government, but are due mainly to circumstances arising from the war and the territorial provisions of the Treaty of Lausanne. Be that as it may, the problem from a constitutional and political point of view is held to be of less importance than that of the 500,000 Kurds, while the other Minorities, Christian, Jewish, and miscellaneous, present no problem at all. It is rightly pointed out that such intolerance as there may be is due to race and not to creed.

While limiting himself strictly to a statement of fact, the author does not disguise his opinion that the advance to complete independence has been too rapid, and that a longer period of tutelage would have been desirable not only in the interests of the Minorities, but of the stability of the new state itself.

The book has some of the defects of its virtues. In limiting himself to a statement of the bare facts, the author says little of the many actors in the drama, and it was one in which personalities played an important part. Nor can any description of the Mandatory period be complete without a just appreciation of the services to their country of the wise old Naqib of Baghdad, Abderrahman Effendi al Ghilani, President of the Council and also of the first Cabinet, of Sassoun Effendi Eskail, the courtly and experienced Minister of Finance, and of that lovable patriot, Abdul Muhsin Pasha Saadun, to mention only those who have passed away; their services in each case having been recognized by the British Government by the grant of knighthood.

Perhaps it is unreasonable to regret that sentiment is allowed no place in the author's treatment of his subject; but one reader at any rate would have welcomed some allusion to the romantic side of the policy by which an Arab monarchy has been once again established in the City of the Caliphs under a warrior king, himself a descendant of the Prophet.

AFRICA

QUEST ROMANTIC: in which a Man goes forth in Search of Morocco's Splendour. By Captain F. H. MELLOR. *London: Selwyn and Blount* [1935]. 9 × 5½ *inches; 288 pages; illustrations and map.* 15*s*

Few who know Morocco would deny it the quality of romance. The descendant of the Prophet, Mulai Idris, founded his kingdom of Western Islam as long ago as A.D. 788, but however chequered and stormy the incidents of its history have been, no real change in the direction and spirit of its culture and civilization took place until the French occupation in 1912. The spell of those eleven hundred years of romantic history remains, and Captain Mellor, writing with charm and humour of the country and its people, conveys some of it to his readers. The book has sixteen excellent full-page illustrations and a useful map on the end-paper. There is the pageantry of gay cavaliers, the picturesque courtesy of Moorish manners, and the artistic beauty of ancient Moorish architecture. Not that the author depicts only the bright side of things. He has not omitted to mention the dirt and discomfort, the heat and sand, the poverty and squalor that

afflict the Sultan's poorer subjects, and the cruelty of its native rulers before the enlightened regime of Marshal Lyautey brought a healing beneficence to the downtrodden.

After that long pause of eleven centuries change has begun again, and the Berber descendants of the people who saw their country invaded by Romans, Vandals, Greeks, and Arabs in turn, are once more watching another set of conquerors at work. New towns and industries are springing up, and the spirit of modernity is making its appearance amidst the orientalism of the Thousand and One Nights. Change is bound to be slow in Morocco for the invading modern spirit has to contend with a people who have an intense belief in magic, in the sanctity of their Shereefs, and in the wonder-working force of their *baraka* or holiness. Yet in spite of religious intensity and the ties of superstition, the story-teller of the Marrakesh market-place delights one with the cynical humour of his tales of rascally imposture such as that of the tomb of the Saint and the dead donkeys (Chapter 4).

With the permission of the French military authorities Captain Mellor penetrated farther into the country than the ordinary tourist can go. Crossing one of the High Atlas passes he reached the town of Ouarzazate and had an interview with the great clan chief El Hamadi El Glaoui. He describes the Caid's Kasba, like "a Norman castle of enormous strength," and the strongholds of the Caid's vassal chiefs scattered along the further slopes of the Atlas and Anti-Atlas Mountains.

In one short chapter Captain Mellor gives the interesting facts of what appears to be the concluding movement of the French military occupation of Morocco. After the large and successful campaign of 1933 only the extreme south-west corner remained independent of the Maghzen's effective control. Early in 1934 a French expedition moved against the Blue Arabs and their notorious chief, Merribi Ribbo, one of the so-called Saints of the Sus country. One force moved south-west along the river Draa. The other force moved south past Ifni, which Spanish co-operating troops occupied for the first time. The two French forces met on the borders of Spanish Rio de Oro, and Merribi Ribbo, deserted by his followers, surrendered to the Spaniards. Thence crossing the River Draa part of the French forces moved south-east and occupied the Algerian town of Tendouf, which is the key of the old caravan route to Timbuctu and the Niger. Captain Mellor mentions only Morocco and Algeria in this connection. There was however a third partner in this co-operation of French Colonial Governments, viz. Mauretania, and the consolidation of their authority has taken permanent form in the creation of a new military command of the "Confins Sahariens." In his last Address to the Legislative Council at Dakar the Governor-General of French West Africa spoke of this fruitful co-operation and the surrender of Merribi Ribbo as bringing in sight the end of the centuries-old story of brigandage in the Western Sahara. E. J. A.

WHITE MAN'S COUNTRY: Lord Delamere and the making of Kenya. By ELSPETH HUXLEY. *London: Macmillan and Co.* 1935. 9×6 *inches.* Volume I, 1870–1914, xiv+316 *pages.* Volume II, 1914–1931, viii+334 *pages; illustrations and maps.* 25*s*

This work is a great achievement by a young and talented authoress who has taken immense pains and whose deductions from the data available often warrant careful consideration. It however affords adequate evidence of the axiom that a biography should preferably not be attempted until the actors in the scene have all passed away. At the same time it must be admitted that the authoress has not glossed over many curious phases of the life of her subject, which according to

his admirers were only due to eccentricity or temporary lack of balance. One gains the impression that throughout she again and again strives nobly to arrive at a judicial verdict, but too often the tie of her brief is a trifle too strong.

Anyway it can be safely admitted that after Sir Charles Eliot, Delamere was the first notable public character to be convinced of the future of Kenya as a British Colony and he fought consistently for this aim. He was unfortunate however in that he suffered from lack of discipline during youth, and a too mercurial temperament, and these factors precluded concentration on any particular effort. He tried too many activities in the early days and lost money at each, as was almost inevitable. Unfortunately for himself he found money too easy to borrow for his many experiments. If he had confined himself to sheep farming, about which he knew much, he would probably have died wealthy.

What might have been a standard history of the birth of European settlement and its progress during the last thirty years is somewhat marred by the rather one-sided vision of this record, but after all it is an able chronicle of the rise of settlement from the colonist point of view. The idea that time and time again the "stupid" or "anti-colonist" local government on the verge of committing some act of gross folly was only saved by the timely intervention of the eccentric superman will be accepted by few. For many years Delamere's power over the majority of the up-country colonists was astonishingly strong, partly due to his position as a peer and partly to his strong personality. Few, if any, of his supporters ever really fathomed his enigmatic nature. The official community rarely felt this spell and were even occasionally repelled by his discourteous outbursts.

One curious feature in his character was the fascination exercised on him by the Masai, and he often pleaded for differential treatment for this tribe. His Masai herdsmen persistently robbed him and he frequently became aware of it, but nothing appeared to change his view. This curious partizanship was probably partly due to their undisputed interest in livestock and partly to flattery at which they are adepts. It is somewhat remarkable that until his later years there was little evidence of his interest in any other natives of Kenya.

There are references in this work to the unfortunate lack of co-operation between the leader of the colonists and the local government. It is hardly necessary to stress the importance of co-operation between Government and all sections of the community, but unfortunately it too often happened that Delamere's version of this laudable aim was somewhat one sided. He could not realize that there was always another side to any problem, and any refusal to accept his proposals in their entirety too often led to unrestrained antagonism on his part, a demand for the removal of whoever had the temerity to oppose him, be it Governor, administrative officer or Director of Agriculture. C. W. H.

NORTH AMERICA

THE WHITE-HEADED EAGLE: John McLoughlin. By RICHARD G. MONTGOMERY. *New York and London: The Macmillan Company* 1935. 9 × 5½ *inches;* xiv + 358*; illustrations.* 15*s*

Mr. Montgomery, who has made himself thoroughly familiar with the very numerous sources of John McLoughlin's life, has written an extremely readable account of this man's career. McLoughlin was of course an extraordinary personality but the author has done him complete justice and at the same time written his life in a most entertaining manner. Mr. Montgomery doubts whether McLoughlin ever studied in Europe and can find no evidence to justify the belief on this point hitherto held. It is certain however that McLoughlin was pos-

sessed of considerable medical knowledge as is evidenced by the numerous patients who benefited by his skill. The doctor's early life and sudden rise in the service of the North-West Company are well told, but one of the most entertaining portions of the book is that which describes his visit to London and his success in bringing about an amalgamation of the North-West Company with that of the Hudson's Bay Company on 20 March 1821.

Many of the documents bearing upon this subject have recently been printed by Mr. W. S. Wallace in a volume published by the Champlain Society. McLoughlin's transfer to Fort Vancouver and his administration of this post from 1824 to 1845 are admirably described. No incident is allowed to assume undue proportions, but the various events are woven into an extraordinary entertaining tale of the rise of this western post. The many-sided activities of McLoughlin as well as his courage and strength in meeting all sorts of difficulties are well brought out. Altogether this biography strikes one as extremely well balanced with the scales held fairly between the many interests concerned. While full praise is given to McLoughlin, his short-comings are by no means overlooked. At the same time, thanks to the author's clear style, the results of his researches into the doctor's labours are set forth in a most entertaining fashion.

The illustrations while having the advantage of being contemporary are on that account perhaps not as detailed as one would like. The volume would have gained greatly by the addition of an outline sketch-map showing the many places mentioned. In this connection the author has perhaps assumed too much knowledge on the part of his readers. While a great deal has already been written in regard to McLoughlin's career, this biography, which is bound to be popular, will do a great deal to place this hero of Oregon history in his well-earned niche.

H. P. B.

ECONOMIC PROBLEMS OF THE PRAIRIE PROVINCES. By W. A. MACKINTOSH and others. (Canadian Frontiers of Settlement. Edited by W. A. MACKINTOSH and W. L. G. JOERG. Vol. IV.) *Toronto [and London]: The Macmillan Company* 1935. 10×6½ *inches;* x+308 *pages; diagrams and maps.* 17*s*

This is Volume IV of 'Canadian Frontiers of Settlement.' As its name indicates, it is not a geographical but an economic treatment of some of the aspects of life on the Canadian prairies, and on the whole the range of the investigation is somewhat narrower than might perhaps have been expected. Actually taxation and financial problems, with very special reference to Saskatchewan, occupy seven out of the twelve chapters, a proportion which tempts one to suspect an under-emphasis of the manifold and complex problems that are not in essence problems of government. Even in these chapters the geographer will recognize how much in the foreground are the geographical conditions, though they are mentioned, when at all, only incidentally. It is however the remaining five chapters, the first four and the last, that will prove of greatest interest and greatest use to the economic geographer. In particular the reviewer would like to record his appreciation of the first two ("Economic Trends" and "Economic Fluctuations"). The value of these chapters lies not so much in the factual information they provide (though there is much of great interest about prairie farming in general and wheat production in particular) as in the convincing exposition they give of the effects of price changes on the progress of settlement and production. Professor Mackintosh does not overstep his immediate task to inquire into the changes in geographical patterns that follow persistent long-period or catastrophic short-period price changes, but the implications are there and are worth serious study by economic geographers. The reviewer has urged elsewhere the

cardinal importance of prices and costs as factors influencing the nature and extent of geographical distributions and the productive methods associated with them, but Professor Mackintosh in these two chapters has given us the germ of what may well in competent hands be developed into a real theory of agriculture geography. Meantime one may hope that they will receive from geographers the attention they deserve. R. O. B.

HUDSON'S BAY COMPANY: A brief history. *London: Hudson's Bay House* 1934. 9×6 *inches; x+68 pages; illustrations and sketch-map*

Profiting by the presence in England last winter of Professor A. S. Morton, of the University of Saskatchewan, probably the greatest living authority on the history of the North-West, the Company has brought out with the help of its expert Archivist, Mr. R. H. G. Leveson Gower, an excellent short history of its activities from 1670 to the present day. The story is a remarkable one and has been told in a most interesting manner. A recent discovery at the Public Record Office has enabled the events of 1697 to be told in a clearer way than before. One gains in a few pages a remarkable bird's-eye view of the whole history of the Company. Last year Mr. Ashley Cooper, the thirtieth Governor, proceeded from Montreal to Churchill in the Company's steamer *Nascopie*. Thence he was able to visit by aeroplane many of the 232 fur-trading posts of the Company. It is interesting to read that the method of trade is still much the same as in the old days. Pages 53 to 67 give drawings of the principal fur-bearing animals taken, one supposes, from the volume issued in 1920 by Sir William Schooling for the Company.

The History is accompanied by a *List of Books relating to Hudson's Bay Company* issued in January 1935. Here has been gathered in Section A all the principal volumes which deal with the Company's History while Section B gives a list of those which contribute substantially to the story. No doubt Professor W. S. Wallace's Collection of Documents on the North-West Company appeared too late to be included in the latter. In any event the reader is given in this list all the principal printed material bearing upon the history of the Company with in many cases a short note dealing with the contents and value of the volumes here listed. Thanks to this list and the admirable arrangement of the Archives by Mr. R. H. G. Leveson Gower, "the subject can be approached to-day with more material readily available and a clearer view of the picture as a whole" than in the past. H. P. B.

AUSTRALASIA AND PACIFIC

THE TWO ROADS OF PAPUA. By EVELYN CHEESMAN. *London: Jarrolds* 1935. 9½×6 *inches; 286 pages; illustrations and route-map.* 18*s*

Miss Cheesman, who is well known to our Fellows both as a lecturer and a contributor to our *Journal*, has made several expeditions to the Pacific chiefly for the purpose of collecting insects for the Natural History Museum. In the present volume she describes a recent visit to New Guinea which she made two years ago. Her object was to collect in the highlands of the interior which are difficult of access owing to the absence of transport.

New Guinea is a land of contrasts between the old and the new. There are few or no roads into the interior, so that there is no motor transport and the only alternatives are to walk or fly, as aeroplanes are used on several routes to facilitate gold-mining operations. Miss Cheesman was lucky enough to be able to reach her first objective, the native police station of Kokoda, lying just north of the central range from Port Moresby, in an hour. It would have taken her several days on foot. In this district she remained for some time, but her plans to reach

the higher elevations on the main range were frustrated by an outbreak of influenza among the natives and eventually she marched to Buna, on the north-east coast, where she obtained a passage round the south-west end of the island back to Port Moresby and thence to Yule Island, whence she made another trip into the interior near Mount Tafa, an isolated peak of some 8000 feet, south-west of the main range. These are the two roads from which she takes the title of her book.

It is to the native Melanesians, their ways and customs, their good and bad qualities, that Miss Cheesman devotes most of her attention. The difficulties of inducing them to work and their thieving propensities were great drawbacks to her plans. She has some very sensible remarks on attacks and assaults on white women by Papuans and other natives which might well be of use to any white woman who is living isolated among coloured people.

The photographs illustrating the volume, taken by Miss Cheesman herself, are rather disappointing, but allowance must be made for the climate and the constant rain and dampness which must be very serious drawbacks to good work. There is a map on the back of the frontispiece quite sufficient to enable the reader to trace the route of the two excursions into the interior. Miss Cheesman has certainly given us a remarkable travel book full of novel and amusing experiences and adventure, and has proved herself a most plucky and energetic traveller. W. L. S.

POLAR REGIONS

JSLAND: Studien zu einer Landeskunde. By WALTER JWAN. Berliner Geographische Arbeiten. Herausgegeben vom Geographischen Institut der Universität Berlin durch Professor Dr. NORBERT KREBS und Priv-Doz. Dr. HERBERT LOUIS. Heft. 7. *Stuttgart: Kommissionsverlag von J. Engelhorns Nachf.*, 1935. $8\frac{1}{2} \times 6$ *inches; 155 pages; 56 Abbildungen auf Tafeln, 52 Textfiguren und einem Plan*

This interesting monograph, although dealing mainly with the physical features of the country, might almost be termed a general geography of Iceland. The sequence is logical, and the work is divided into four main parts: (1) The geology and general structure; (2) types of landforms and glaciology; (3) the human geography of the country; (4) appendices and bibliography.

It is obvious that the districts actually visited by the author are dealt with more fully than other regions of perhaps greater importance. For example, in the chapter dealing with old beach-lines, the 100-metre beach at Tjörnes is described as being late Pliocene, but unfortunately no correlation has been attempted with the excellent beaches of the south-east coast. The glaciological section deals chiefly with Hofsjökull. The terrific annual thaw is described, together with such interesting features as the characteristic dirt cones, and masses of relic ice, buried under debris and separated from the ice-caps by the recession which is still going on. Herr Jwan states that some of these detached masses of relic ice may have been preserved by their coverings of dirt for as much as thirty years. This estimate is probably very conservative, several masses of detached ice on the northern edge of Vatnajökull having been preserved for what must be a very much longer period than this.

The section dealing with the human geography opens with a few notes on the early colonization and origin of the Icelandic race. Fluctuations of population with possible causes are dealt with, while the striking contrast between the large area of desert highland and small areas of habitable lowland is well brought out.

The present-day occupations of the Icelanders, with emphasis on fishing, are

well described. Politics are even touched upon when Herr Jwan writes about a small communist party, a product of the growth of Reykjavik, and the advent of class distinction. The appendices are a valuable contribution and the bibliography is commendably complete. Great care has obviously been expended in compiling an accurate work.

The text is illustrated by many excellent photographs and numerous diagrams and maps. A few of the latter, notably those dealing with the distribution of forests and highland oases, are rather misleading; on the other hand others are of much merit, as for example the map showing Inland Routes and combining the ancient Vatnajökullsvegur with the modern auto-routes.

"Jsland" is a well-set-out and accurate work, which should prove a valuable addition to the literature on this interesting country. It is a pity that a good orographical map and a general index have not been included. J. A. B.

PHYSICAL AND BIOLOGICAL GEOGRAPHY

GEOLOGIE AFRIKAS. (Geologie der Erde. Edited by E. KRENKEL.) Dritter Teil, erste Hälfte. By ERICH KRENKEL. *Berlin: Borntraeger* 1934. 10½×7 *inches;* viii+1003–1304 *pages; illustrations and maps. M.*28

This section of the *Geologie der Erde* deals with West Central Africa, divided into Angola, Northern Rhodesia, and the Congo Basin. As in the case of the Asiatic section recently published, we have part of an ancient continental mass, but here there is no marine Palaeozoic, unless the dolomites, in which the only fossils —calcareous algae—have been found, are given that age. The ancient rocks are covered in the central part of the basin by Karroo beds—continental deposits of late Palaeozoic to Early Mesozoic age. Cretaceous and Tertiary marine deposits are confined to the coastal region, where they form an almost continuous strip, up to 200 km. in width. Mineral wealth occurs in the ancient rocks and the igneous masses which penetrate them, while coal is found in the Karroo system. Thus the two far-separated regions, Siberia and West-Central Africa, have a general similarity in geological structure and history, though with differences of detail. A. M. D.

GEOLOGY OF EGYPT. By W. F. HUME. Volume II. The Fundamental Pre-Cambrian Rocks of Egypt and the Sudan; their distribution, age and character. Part I. The Metamorphic Rocks. (Ministry of Finance, Egypt. Survey of Egypt.) *Cairo: Government Press* 1934. 11×7½ *inches;* lxvi, 300 +124*; illustrations and maps. P.T.*300

This volume constitutes one section of the monumental work which is being produced by Dr. Hume under the auspices of the Egyptian Government. The portion under review deals mainly with the great series of metamorphic rocks which dominate the mountainous area between the Nile and the Red Sea to the south of the Tertiary sedimentary gulf which extends southward from the Mediterranean. The rocks of the Sinai peninsula are also dealt with herein.

The author is apparently not restricted to space, for the greater part of the work is composed of extracts *in extenso* from the work of every writer who has expressed any opinion on points at issue. This plan has the advantage of obviating laborious reference to the dicta of a multitude of past investigators; the result is however that it is difficult to "see the wood for the trees" and without intensive study to obtain a grasp of the general structure. Above all one would like more of the author's views on the genesis of this extraordinary complex. The *lacuna* is however not altogether the fault of the author, for in the region referred to the geological survey is still apparently in the reconnaissance stage,

due in a great measure to the difficult nature of the terrain and the desert conditions.

A few points of general interest emerge. The fundamental gneiss is a regional phenomenon rather than local, and it has a marked resemblance to the vast series of rocks of this description which cover such large areas in the eastern half of Central Africa and also in South Africa. This gneiss again, according to the author, has a fundamental position as the base rock of the metamorphic schists of Eastern Egypt. Here again it may eventually be proved that the schists are also part of the series which is so prominent in East Africa to the east of the Rift Valley and which up to now have been little studied by petrologists.

The correlation of the information which is being gradually amassed on the geology of Africa from Egypt to the Cape can hardly as yet be attempted. It will inevitably be a colossal task, but if carried out with competence will do much to enlighten us regarding both the structure of the African continent and the geotectonic forces which moulded its shape. This continent has long been regarded as being probably the oldest land surface on the globe; not even Wegener has accused it of "drifting." At the same time it has not escaped a terrific amount of crustal deformation, and in later eras has experienced the peculiar phenomenon known as "rifting," the origin of which is still somewhat obscure. There are now many workers each endeavouring to elucidate the structure of his own particular area and each giving local names to the formations therein, and when in the future some twentieth-century Suess essays the task of writing the early history of the continent this carefully annotated catalogue of Egyptian rock occurrences will doubtless prove a mine of information.

This may appear to be a rather summary description of the volume; but it is an unsatisfactory task to review one section of a work which runs into a number of parts, some of which are unpublished, for the author's final summary of his mature conclusions on the origin and formation of the complex which forms the backbone of Egypt is not yet available.

The wealth of coloured plates in this publication is an amazing feature and those of the rock sections are very beautiful and show great care. C. W. H.

HEAD, HEART AND HANDS IN HUMAN EVOLUTION. By R. R. MARETT. *London: Hutchinson* 1935. 9 × 5½ *inches;* 302 *pages.* 10*s* 6*d*

In this book the author lets himself go rather more than usual and allows us to see some of his thoughts about problems of civilization and religion. He criticizes the diffusionist theory of Father Wilhelm Schmidt because he believes the spontaneous element in any live form of religion is no less characteristic than the derived, and he does not think we should postulate an original theism later obscured by superstition. He also dissents from Frazer, who is inclined to describe magic and religion as two very different schemes; for Marett there is a continuity in social and religious evolution from the beginning, and he is very clear that man is a social being *ab initio*. The rapid review of primitive technology is not perhaps as helpful as one might have hoped, and here, as elsewhere, one could wish that geographical distribution had received more attention. The distribution of the *coup-de-poing* of the lower Palaeolithic from Britain, France, and Spain to South Africa, with a few outposts in India, stands contrasted with that of pre-Mousterian flakes which appear to belong to Eurasia. The developments of the flake idea when it got into contact with the people who had generally used cores are probably one of the most important lines of study in a field where knowledge is growing very fast. The bearing of contacts on cultural development is a topic by no means exhausted. H. J. F.

CARTOGRAPHY

THE PLACE-NAMES OF ESSEX. By P. H. Reaney. (English Place-Name Society. Volume XII. General Editors: A. Mawer and F. M. Stenton.) *Cambridge: University Press* 1935. 9×5½ *inches;* lxii+698 *pages; maps.* 25*s*

Former volumes of this valuable series have been reviewed in the *Journal* from time to time, so it is unnecessary to deal at great length with this latest issue, since it is planned on the same lines as the rest, conforming throughout to their method of arrangement. In one way it differs however in that the research on which it is based was not primarily undertaken with a view to supplying a volume for the series, but had been in progress for some years before the English Place-name Society was founded. Therefore, although in its final form it is the result of the collaboration of many workers, its authorship is justly accredited to Dr. Rainey, whose painstaking labours through many years have laid the foundation of the whole. In only one previous case—that of the North Riding of Yorkshire—has a single worker, apart from the general editors, been put down as author.

As in the series as a whole, the guiding principle throughout has been to go back as far as possible to the very earliest records so as to get at the true primitive form of the names. More than this, it is intended to place on record all the divergent forms that can be traced through the centuries with complete references to the documents or other authorities from which they are taken. This has naturally involved a vast amount of research, and the result is a solid mass of information to which all students of the subject must turn in future, rather than a work which can be read consecutively.

Certain sections are however of interest to the general reader, particularly the excellent introduction in which the special conclusions to be drawn from the study of Essex names are judiciously summarized, showing how much light it throws on the early history of settlement or the primitive condition of the surface. Thus certain names indicative of heathenism supply evidence, not found in such abundance in any other county yet studied, that the whole was populated by Saxons at a time when heathen beliefs were strong and flourishing, and the evident great antiquity of various other names supports the idea of earlier settlement than has been supposed by archaeologists. The wide extension of certain names indicate the occupation of fairly large areas by single communities. There is no doubt that the approach to Essex was from the sea, and by the river estuaries, as is confirmed by the occurrence of ancient names on portions of the coast now low and marshy. This fits in well with indications of a different order that the ancient level relatively to the sea was much higher, probably at least 15 feet. Again, the extent of the forest area avoided by early settlers can be seen from the distribution of woodland names. Place-names show that while Scandinavian influence in the county was not negligible, there was little actual settlement. Names like Chesterford or Colchester recall the Roman occupation, but it is the imprint of the Norman Conquest that is especially strong.

The greater part of the book is taken up with the catalogue of places, arranged by Hundreds and Parishes, but there are the usual sections on special categories of names, the elements found in them, and their distribution. That on the elements represented does not entirely dispense with reference to the general volume of the series on this subject, and it seems a pity that the meaning of each element is not clearly explained even when it is now first dealt with. It is too late, no doubt, to criticize the system of abbreviation (necessarily very drastic) adopted in the references to authorities, which shows a good many inconsistencies: it merely carries on that originally chosen by the general editors, and the present author is not responsible. The references to the earliest maps, it

may be noted, betray some lack of appreciation of their relative importance. No account is taken of Norden's of 1594 (the first to show roads), while that issued by Woutneel in 1602, little more than a copy of Saxton's, finds a place in the bibliography. And it is wrongly attributed to Peter Stent, who merely re-issued it many years later.

As the Hundreds are not placed in alphabetical order and there is no general conspectus of the arrangement, a given parish or place cannot easily be found without reference to the general index. There is an interesting series of Distribution maps, as well as a general map naming all the parishes. E. H.

ECONOMIC AND HISTORICAL GEOGRAPHY

INDUSTRY AND SOCIETY: how we Work and how we are Governed. By F. H. SPENCER. *London: University of London Press* 1935. 7½×5 *inches;* 200 *pages; illustrations.* 2*s* 6*d* (*limp* 2*s* 3*d*)

This small book, written for school use, is a most useful publication. The material presented is divided into two sections, the first dealing with how we work, the second with how we are governed. In the first section Dr. Spencer is concerned with the presentation of such issues as the facts of modern classes of work, the sub-division of labour and machine production, the mode of payment for work performed, the large-scale methods of production, and the organizations of both employers and employed. In the second section there is an explanation of the way in which the affairs of the nation are controlled through local and central government.

It might reasonably be expected that within the limits of this small book the treatment of these vital matters might become only a cataloguing of the facts. This however is not the case, for Dr. Spencer presents the material in a most lucid and interesting manner, and every boy and girl who is brought into contact with this book will find it not only a sound source of information but a stimulant as well. Each chapter has a series of exercises based upon it and these are of a type to call forth intelligent effort. It would not be right to say that several were too difficult because they might well defeat many present-day voters. Rather one should stress the necessity of every person being acquainted with such facts as are contained in this book and it is unnecessary to state that the subject-matter is intimately associated with the teaching of geography. G. H. J. D.

THE GROWTH AND DISTRIBUTION OF POPULATION. By S. VERE PEARSON. *London: George Allen and Unwin* 1935. 9½×6 *inches;* 448 *pages; illustrations and maps.* 12*s* 6*d*

In his Preface the author remarks that "An understanding of the problems connected with the growth and distribution of population requires a knowledge of economics and psychology." He warns the reader that his conclusions differ from those of many previous writers, and that, in his view, wrong ideas have sprung up on such matters as over-population, restricted emigration, and differential birth rates. He rather disarms a geographer, however much the latter may disagree with him on certain elements of the subject, by emphasizing the geographical factor.

To take one important part of the subject, the relation between population and food supply, he is of opinion that "increasing crop yields can meet the needs of the increasing population of the world"; but, curiously enough, in his discussion of this problem, he nowhere specifically quotes Sir Daniel Hall's important investigation of the relation between population and available acreage, though he does quote Lord Bledisloe's opinion that Sir Daniel had under-

estimated the power of research work in increasing the yield of wheat. It is obvious that Sir Daniel is the last man to underestimate the value of science in its application to agriculture, and it would have been more satisfactory if the author had paid more attention to his investigation.

On a less debatable matter, he approves of Professor Ellsworth Huntington's —he sometimes spells the name Hunting*d*on—statement to the effect that the main determinants of population are soil, relief, and climate, to which trio the author adds economic influences, pointing out the excellent circumstances of New Zealand, which is only sparsely populated because it is out of the way. He rightly stresses the fact that food production is of immense importance in connection with population questions, and that we should study to find out where the various food-stuffs can be most economically produced. But he also thinks that England should grow more wheat and still more should "produce more foodstuffs of other kinds. It would be healthier if more people took up such pursuits."

These matters are not easily solved. "French wheat production costs are two or three times those of Argentina and Canada." The cost of wheat protection—that is one of the difficulties. The author is apparently of opinion that this country could immensely increase its production of food. But though most of us would wish to see our home food supply, let us say, doubled, we think that it will take a long time to reach such a desirable result, which can only eventually be attained through the patient application of scientific methods. We also think that there is a limit to progress in that direction, and that another factor, numbers, also deserves consideration. Great Britain is at the present time, in the matter of food, in a worse position than at the outbreak of the war. The military factor also deserves attention. The author mentions that no country circumstanced like ours is actually self-supporting—as a fact we import about 62 per cent. of the food that we eat—"France, with a population density of 190 per square mile, comes nearest to this condition." And finally, "according to some," wheat growing can only be permanently successful "on the great plains of the world, such as North America, Argentina, Australia, and Russia."

That question of food supply is only one of the many topics which are dealt with by the author, often in an original way. He is not to be thought of as belonging to any of the regular political schools; he appears to disagree with all of them. "Even parties carrying the label Liberal vie with reactionaries and Socialists in restricting liberty and multiplying officials,"—so says our author. He has indeed a poor opinion of Government interference in most of the matters touched upon. Poor Governments! They are doing their best in a difficult world. Next to Governments he dislikes landlordism; and after landlordism, eugenics.

There is much of interest in the chapter on "Town and Country Planning." The author remarks that "The number of professional people (including the lawyers, of course) who are earning fees by discussing and drawing up reports on town and country planning is rising rapidly and out of proportion to the accomplished results." He thinks that a main cause of ribbon development is "the natural temptation of landowners to capitalize the value that lies ready to hand in sites already furnished with good frontages and probably also with services. . . . Now if the principle adopted amongst primitive people that land is the property of the tribe had been recognized, and if the values given to land had always been employed in public benefit, there would have been no clash of private and public interests. . . ."

The book covers a wide field. The author discusses such matters as The Growth of Cities; Birth and Death Rates; Garden Cities; Housing; Emigration;

all elements of a difficult subject. He has original remarks to make on most of these matters, and, though we may not always see eye to eye with him in his treatment of them, we shall most of us agree that intelligent opposition to generally accepted views may serve a useful function. C. F. C.

GENERAL

HANDBOOK OF TRAVEL. Prepared for the Harvard Travellers Club. Edited by GEORGE CHEEVER SHATTUCK. Second Edition, revised and enlarged. *Cambridge, Massachusetts: Harvard University Press* (*London: Humphrey Milford*) 1935. 7×4½ *inches; 510 pages; illustrations.* 12*s* 6*d*

This book is divided into four parts dealing with Methods of Travel; Camping; Recording and Collating; Hygiene, Medicine, and Surgery. Most chapters of this handbook consist of a summary of the principal considerations with which the traveller would be concerned, together with as much in the way of detailed hints as can be squeezed into the very limited space available, followed by a bibliography of works from which full and detailed information can be gleaned. Though in Parts I and II the terrain is with one or two exceptions confined to the New World, the references are by no means confined to American authorities. For instance the list following the chapter on Mountain Climbing consists entirely of British authors. The chapters themselves are all by American writers of experience. Turning, for instance, to Caravan Travel in Mongolia we find that this has very appropriately been done by Owen Lattimore.

It is natural to compare the 'Handbook of Travel' with our 'Hints to Travellers.' In the preface the editors state that "The purpose of this handbook is twofold: first to offer the prospective traveller a great variety of information which may be useful to him while planning his expedition and, second, to provide a compact volume which will be useful in the field." On turning to 'Hints' (Tenth Edition) I was surprised to find that the exact purposes are not stated. Presumably they are the same but with the order of priority reversed. The most outstanding difference between the two books is that the 'Handbook of Travel' devotes a mere eleven pages to survey and position finding, leaving the whole subject to be learnt up beforehand from standard text-books, whereas in 'Hints' a whole volume is devoted to it.

In many ways the two books are complementary, the 'Handbook' being of decidedly more value than the last edition of 'Hints' to the prospective traveller while preparing for a type of travel he has not previously experienced, whereas 'Hints' is by far the more useful book to take with one on an actual journey. As might be expected in an American version the question of food and diet is worked up in great detail (but with what degree of authority I am not competent to say). Judging by the dietary mistakes made by many British expeditions in the past this matter will presumably be attended to in the new edition of 'Hints,' vol. ii. R. A. B.

RECOLLECTIONS OF A GEOGRAPHER. By E. A. REEVES. *London: Seeley, Service & Co.* [1935]. 9×5½ *inches; 224 pages; illustrations and maps.* 8*s* 6*d*

Sir Francis Younghusband in a foreword commends this book as delightful reading and good to have on record. It will surely serve to perpetuate the memory of an old friend, happily still with us, whose life was devoted to the service of the Royal Geographical Society and to the cause of Geography. When he retired from the post of Map-Curator and Instructor in Surveying in 1933 Mr. Reeves had been a familiar figure in the Map Room for more than half the century-long

life of the Society, and his recollections, here set forth, recall to his old colleagues and innumerable friends the once familiar figures of bygone travellers, presidents and secretaries, men who made history in the uttermost parts of the Earth and recorded it in the publications of our Society. An appreciation of the work of Mr. Reeves and some account of its variety and extent were given in the *Journal* when recording the presentation to him of the Victoria Medal in 1928, and his resignation five years later. The book now before us shows the same facts from Mr. Reeves' own point of view and reveals with simple and attractive frankness the nature of a sincere, capable and friendly man.

In addition to his recollections of life in the R.G.S. Mr. Reeves gives a popular summary of some of his original work in the design of apparatus and the study of magnetic phenomena, as well as of his war-time labours.

There are excellent portraits and other illustrations. One of these is a reproduction of the drawing of the house at Mitcham where Mr. John Coles lived while Map-Curator of the Society, the excellence of which as the work of a boy of fifteen led to the engagement of young Reeves as an assistant in the Map Room, and so to his fame as the trainer in surveying of over 1700 potential explorers.

H. R. M.

WILD FLOWERS OF THE GREAT DOMINIONS OF THE BRITISH EMPIRE. By the LADY ROCKLEY. *London: Macmillan & Co.* 1935. $8\frac{1}{2} \times 6\frac{1}{2}$ *inches;* xii + 380 *pages; illustrations.* 16*s*

The traveller who has no special botanical knowledge often feels the need of some non-technical book to guide him to the best localities for wild flowers in the countries he visits and to help him to identify the more interesting or conspicuous species. In the present volume Lady Rockley has set out to provide such a book covering the great Dominions of the British Empire, including one or two of the African Colonies. It was a task that might daunt the most courageous, but the authoress, who has travelled widely through the regions she describes, has produced a delightful work which will undoubtedly appeal to a wide circle of readers. Canada, Australia, New Zealand, South Africa, Rhodesia, and Kenya are dealt with in turn, and in each country the typical features of the vegetation are vividly described from first-hand knowledge.

The value of the book is enhanced by a fine series of coloured plates. Many of these are sketches of the vegetation made by Lady Rockley during her travels. Though often made hurriedly and under difficulties, they convey admirably an impression of their subjects. Especially fine are the pictures of the fir forests of British Columbia and of the spring flowers of Western Australia. In addition, there are plates of single flowers and of groups of typical species from definite regions.

In a descriptive work of this kind, the style is apt either to be that of the typical guide book or to be so exaggerated and effusive that much of the practical value is lost. On the whole Lady Rockley has steered successfully between these two extremes and great care has obviously been exercised to make the botanical names correct. The format is rather heavy for a book which will inevitably be "wanted on the voyage," and the lavish use of capitals for English names is perhaps unnecessary. Lady Rockley, who, as the Hon. Alicia Amherst and later as the Hon. Mrs. Evelyn Cecil, has so enriched the literature of horticulture, is to be congratulated on carrying through an ambitious project with such signal success.

J. S. L. G.

THE MONTHLY RECORD

GEOLOGICAL EXPLORATION OF SIBERIA

'A History of the Geological Exploration of Siberia, 1851–88,' by V. A. Obruchev (Academy of Sciences, U.S.S.R.), has recently been received by the Library. This is a comprehensive bibliography of the geological exploration of Siberia between 1851 and 1888, including the work of English, French, and German scientists and explorers. The book contains eight chapters, in which the relevant material is summarized in varying degrees of detail; from these reference is made by numbers to an author list of publications at the end of the work. Reference is further assisted by a chronological index of authors, and a Latin index of the fossil flora, and fauna.

The first chapter gives a general survey of the period, with short biographies of the chief explorers. The remaining chapters treat of the six regions into which the author divides Siberia. Western Siberia and the Kirghiz territory was systematically explored by geologists and prospectors during this period, the first comprehensive survey of the Kirghiz steppe being made by Tatarinov and Belussov studying the coal and copper deposits of the Pavlodar and Karkalinsk districts. To the south-west, geological exploration was confined mainly to the Altai and Sayan mountains: of the former Cotta published a general description including a survey of the ore deposits, and the mines were described by Grivnak. Poletika and Bogdanovich surveyed the Minusinsk and Kuznetsk basins.

The Central Siberian plateau was explored north and south: the goldfields of the Lena district were given especial attention and in the south the coalfields were established as definitely belonging to the Jura age. Cherski investigated the geological structure of the shores of Lake Baikal, and on the strength of his publications the theory that the lake was due to a sudden subsidence has been definitely abandoned.

In the extreme north expeditions were sent to the Novo-Sibirsk islands and the Verkhoyansk range: while in the extreme east great progress was made in the exploration of the newly annexed territories of the Amur, Ussuri, and Sakhalin, where prospecting for gold played a large part in the work of the expedition. A geographical survey of the Amur region and part of the maritime province, and a geological and mining survey were undertaken by Bogolyubski and Maksimovich.

The concluding chapter contains a review of works dealing with the whole of Siberia, its mountain strata, minerals, ore deposits, flora and fauna fossils. A brief summary of the theories on the tectonic structure of the earth arrived at in Western Europe is given and its influence on the work of Russian explorers discussed. According to Obruchev the majority of these, partly through ignorance, disregarded the more modern hypothesis in favour of the older Plutonic theory of the earth's formation. The most important of the Russian works were Meglitski's researches in Trans-Baikalia; Middendorff's in nearly the whole of Eastern Siberia; Semenov's in the Amur basin; Kropotkin's in Eastern Siberia; Cherski's in the whole of the mountainous region of Southern Siberia and between Irkutsk and the Urals. Schmidt gave a survey of the distribution of all the sedimentary formations in Siberia, and Neumayer, corrected by Nikitin, that of the Jura formations.

A chronological index of authors of the period is attached. The numerals after each name denote their corresponding number in 'Geological Literature 1851–1888.' A subject-index (in Russian) and a Latin index of the flora and

fauna fossils are included. A complete index of 'Geological Literature 1851–1888,' with the names of the authors placed in alphabetical order and the numerals preceding each title corresponding to the number in the publications, in direct sequence from the preceding period, are to be found at the end of the volume. M. Z.

BULGARIAN PLACE-NAMES

By a decree of the Ministry of the Interior, issued in Sofia on 9 August 1934, 1166 Bulgarian place-names were altered and the whole country subdivided according to a new system. Hitherto Bulgaria has been divided into 16 provinces (*oblasti*), which have now been reduced to 7 by the new decree—Burgaz, Vratsa, Pleven, Sofia, Stara, Zagora, and Shumen. Of the 1166 alterations 11 are towns, 853 villages, 242 hamlets (*makhala*), 44 mountain settlements, 2 plain settlements, 10 railway stations, 3 localities, and 1 estate. A list of all these alterations is given in the Governmental Gazette (*Derzhaven Vestnik*) of 14 August 1934.

The principles on which these changes have been made are not always clear, but a close examination of the new names, and a comparison with the old, generally reveals one or other of two motives—either the replacing or translation of a Turkish or Greek name by a Bulgarian (especially in districts where the Turkish and Greek populations are decreasing); or the replacing of a colourless name (Turkish or Slavonic) with no historical associations by a name recalling some great figure in Bulgarian history. In the first category would come such changes (taken at random from the *Derzhaven Vestnik*) as *Zvezdets* (zvezda *Bulg.* star) for the Turkish *Gök tepe* (*Turk.* blue hill), *Jelezovo* (jelezo, *Bulg.* iron) for the Turkish *Demir Desh* (*Turk.* iron stone); and *Pomorie* (*Bulg.* coast) for Greek *Ankhialo* (Ἀγχίαλο, *Gk.* by the sea), or *Tsarevo* (*Bulg.* Tsar-town) for the Greek *Vassiliko* (Βασιλικο=*Gk.* royal). In the second category come such changes as *General Toshevo* for the Turkish *Talashmanli*, *Sveti Kliment* (*Bulg.* Saint Clement) for the Turkish *Ovchelare*, *Patriarch Evtimievo* for the old *Pranga*. It will be seen that in the majority of cases these historical names replace Turkish ones; but there are also cases of a Slavonic name disappearing as *e.g. Alikochevo* becoming *Captain Dimitrievo*.

NAMES OF OTHER COUNTRIES

In 1926 a so-called Latin alphabet was invented for the Turki-Tatar language in Russian Turkistan. This alphabet consists of 32 letters, 9 vowels and 23 consonants: it has no capital letters. The Society has recently received a letter from Professor Veksmin, of the University of Kazan, in which he gives the Tatar equivalents for all those countries whose names, in the 20 languages which use the Latin alphabet, were given in the May *Journal* of this year. The majority of these names are mere transliterations of the Russian, with the final *ya* (in *Italiya*, for instance, converted into ä—thus, Italiä: and the Russian soft sign represented by an apostrophe—thus *Russ.* Polsha (with a soft sign between the *l* and *s*) becomes *Pol'şa* in the Tatar language. The Tatar name for Great Britain, *Büyek Britaniä* is taken from the Turkish *Büyük Britanya*: but Greece and Hungary appear in Tatar as *Gretsiä* and *Vengriä*, thus following the Russian, and not the Turkish *Yunanistan* and *Macaristan*.

REGIONAL GEOGRAPHY IN AUSTRALIA

Attempts at the regional subdivision of parts of Australia were made long ago, but not until the late Professor J. W. Gregory attempted to subdivide Victoria, and Griffith Taylor the whole continent, were the methods better than arbitrary. Gregory's subdivisions were topographical; Taylor's were based on rainfall.

The schemes, both admirable for special purposes, were neither final nor suitable for general use, but they demonstrated the existence of definable regions. The difficulty lay in the recognition of the elements of regional unity. Through Griffith Taylor's interest in the subject, the 17th Meeting of the Australasian Association for the Advancement of Science (Adelaide, 1924) appointed a committee to study the "natural regions" of Australia. The term "natural region" was sharply criticized, by Victorian members in particular, but two definitions were independently submitted to the Meeting (*Rept. Australasian Assoc. Adv. Sci.*, 17, Adelaide, [1924] 1926: 111–112), and active interest was aroused. The committee no longer exists, but the work is being done. Australian geographers are trying to answer the question: "How can we divide the country into parts, really different, which will serve the practical purposes of its development?" The first results were embodied in a paper on "Natural Regions in Western Australia," by E. de Courcy Clarke (*Journ. Roy. Soc. W. Australia*, 12 [1925]: 117–132). The scheme was so reasonable that it gained quick recognition, and Clarke's map was reprinted abroad. Griffith Taylor then published a note on "Natural Regions in New South Wales" (*Rept. Australasian Assoc. Adv. Sci.*, 18, Perth [1926] 1928: 474–477). His scheme is broadly satisfactory, but his sketch-map leaves the work of precise delimitation still to be done. Dr. C. Fenner made the next contribution, in a paper on "The Natural Regions of South Australia" (*Rept. Australian and New Zealand Assoc. Adv. Sci.*, 20, Brisbane [1930] 1931: 509–545), which, supplemented by illustrations of types of landscape, was reprinted in his book 'South Australia' (Melbourne and Sydney, [1931]). Fenner's work is by far the most searching, and shows clearly the principles involved. The first subdivision is climatic; the second is "physiographic" where relief is pronounced, hydrological and botanical where it is not; and the third rests on principles like those of Passarge's 'Landschaftskunde' and of the 'Naturkomplexe' of the East Baltic geographers. Fenner's "natural" regions are parts of "physiographic" (geomorphological) units, which, in turn, are parts of climatic provinces. His climatic boundary continues, though it is not specifically distinguished, on Clarke's map of Western Australia. This boundary between climatic regions, now established in South and Western Australia, was foreshadowed in Taylor's earlier work. It is enough to show that the regional scheme, when complete, will be in accord with the marked zonal relationships already revealed in Australian geography by less particularized schemes (*cf.* "Natural Divisions of Australia," *Geogr. J.*, vol. 85 [1935] 301–302). A further contribution has now come to hand, from Victoria. In an 'Outline of the Physiography and Geology of Victoria' edited by Professor E. W. Skeats and reprinted from a 'Handbook for Victoria' prepared for the 22nd Meeting of the Australian and New Zealand Association (Melbourne 1935), Dr. E. S. Hills has an article on "Physiography," in which he divides Victoria into five "physiographic" regions, three of which he subdivides, but on the same principle. His work is a correction and extension, rather than a revision, of Gregory's work, and manifests the Victorian desire, expressed at Adelaide in 1924, for unmistakable boundaries. His text nevertheless implies his desire to be reconciled with Fenner. His subordinate "physiographic" boundary, by no means purely physiographic, between the Wimmera and the Mallee, corresponds to Fenner's subordinate boundary between the "Murray Mallee" and the "Ninety Mile" regions of South Australia. His boundary between the "Murray Basin Plains" and the "Eastern Highlands" agrees, too, with a boundary in New South Wales, roughly indicated on Taylor's sketch-map. These four papers show that Australian regional geography is proceeding, as advised by the defunct Committee

on Natural Regions, with deliberate avoidance of haste, and with accordant results. The map of regions of Fenner's second order of magnitude now covers three adjoining states and extends into a fourth. It is interesting to note that the average size of these "physiographic" regions is about that of American states. The validity of the subdivision is expressed by its clarification of the meanings of regional names that have long been in popular use in southern Australia. M. A.

OXFORD UNIVERSITY EXPLORATION CLUB

The Seventh Annual Report of the Oxford University Exploration Club gives a short review of the expeditions then in the field and records certain changes in the officers of the Club. The heavy duties of the chief officers, particularly of the Editor, have necessitated some rearrangement, but the vitality of the Club is clearly indicated. The Committee anticipate a continuation of the work, but probably with smaller and less expensive expeditions until the Club funds recover from the heavy calls made upon it by some of the recent large expeditions.

There follows a short note on the expedition to the New Hebrides. This report creates a useful precedent in detailing the kind of preparations which should be made by an expedition to that part of the world, and gives information as to transport, methods of purchase from natives, health conditions, and so forth. The accounts of the expedition are published and they show that, apart from fares and freight, the expedition has cost less than £600, which works out at less than £100 per expedition member.

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fauna fossils are included. A complete index of 'Geological Literature 1851–1888,' with the names of the authors placed in alphabetical order and the numerals preceding each title corresponding to the number in the publications, in direct sequence from the preceding period, are to be found at the end of the volume. M. Z.

BULGARIAN PLACE-NAMES

By a decree of the Ministry of the Interior, issued in Sofia on 9 August 1934, 1166 Bulgarian place-names were altered and the whole country subdivided according to a new system. Hitherto Bulgaria has been divided into 16 provinces (*oblasti*), which have now been reduced to 7 by the new decree—Burgaz, Vratsa, Pleven, Sofia, Stara, Zagora, and Shumen. Of the 1166 alterations 11 are towns, 853 villages, 242 hamlets (*makhala*), 44 mountain settlements, 2 plain settlements, 10 railway stations, 3 localities, and 1 estate. A list of all these alterations is given in the Governmental Gazette (*Derzhaven Vestnik*) of 14 August 1934.

The principles on which these changes have been made are not always clear, but a close examination of the new names, and a comparison with the old, generally reveals one or other of two motives—either the replacing or translation of a Turkish or Greek name by a Bulgarian (especially in districts where the Turkish and Greek populations are decreasing); or the replacing of a colourless name (Turkish or Slavonic) with no historical associations by a name recalling some great figure in Bulgarian history. In the first category would come such changes (taken at random from the *Derzhaven Vestnik*) as *Zvezdets* (zvezda *Bulg.* star) for the Turkish *Gök tepe* (*Turk.* blue hill), *Jelezovo* (jelezo, *Bulg.* iron) for the Turkish *Demir Desh* (*Turk.* iron stone); and *Pomorie* (*Bulg.* coast) for Greek *Ankhialo* (Ἀγχίαλο, *Gk.* by the sea), or *Tsarevo* (*Bulg.* Tsar-town) for the Greek *Vassiliko* (Βασιλικο=*Gk.* royal). In the second category come such changes as *General Toshevo* for the Turkish *Talashmanli*, *Sveti Kliment* (*Bulg.* Saint Clement) for the Turkish *Ovchelare*, *Patriarch Evtimievo* for the old *Pranga*. It will be seen that in the majority of cases these historical names replace Turkish ones; but there are also cases of a Slavonic name disappearing as *e.g. Alikochevo* becoming *Captain Dimitrievo*.

NAMES OF OTHER COUNTRIES

In 1926 a so-called Latin alphabet was invented for the Turki-Tatar language in Russian Turkistan. This alphabet consists of 32 letters, 9 vowels and 23 consonants: it has no capital letters. The Society has recently received a letter from Professor Veksmin, of the University of Kazan, in which he gives the Tatar equivalents for all those countries whose names, in the 20 languages which use the Latin alphabet, were given in the May *Journal* of this year. The majority of these names are mere transliterations of the Russian, with the final *ya* (in *Italiya*, for instance, converted into ä—thus, Italiä: and the Russian soft sign represented by an apostrophe—thus *Russ.* Polsha (with a soft sign between the *l* and *s*) becomes *Pol'sa* in the Tatar language. The Tatar name for Great Britain, *Büyek Britaniä* is taken from the Turkish *Büyük Britanya*: but Greece and Hungary appear in Tatar as *Gretsiä* and *Vengriä*, thus following the Russian, and not the Turkish *Yunanistan* and *Macaristan*.

REGIONAL GEOGRAPHY IN AUSTRALIA

Attempts at the regional subdivision of parts of Australia were made long ago, but not until the late Professor J. W. Gregory attempted to subdivide Victoria, and Griffith Taylor the whole continent, were the methods better than arbitrary. Gregory's subdivisions were topographical; Taylor's were based on rainfall.

The schemes, both admirable for special purposes, were neither final nor suitable for general use, but they demonstrated the existence of definable regions. The difficulty lay in the recognition of the elements of regional unity. Through Griffith Taylor's interest in the subject, the 17th Meeting of the Australasian Association for the Advancement of Science (Adelaide, 1924) appointed a committee to study the "natural regions" of Australia. The term "natural region" was sharply criticized, by Victorian members in particular, but two definitions were independently submitted to the Meeting (*Rept. Australasian Assoc. Adv. Sci.*, 17, Adelaide, [1924] 1926: 111–112), and active interest was aroused. The committee no longer exists, but the work is being done. Australian geographers are trying to answer the question: "How can we divide the country into parts, really different, which will serve the practical purposes of its development?" The first results were embodied in a paper on "Natural Regions in Western Australia," by E. de Courcy Clarke (*Journ. Roy. Soc. W. Australia*, 12 [1925]: 117–132). The scheme was so reasonable that it gained quick recognition, and Clarke's map was reprinted abroad. Griffith Taylor then published a note on "Natural Regions in New South Wales" (*Rept. Australasian Assoc. Adv. Sci.*, 18, Perth [1926] 1928: 474–477). His scheme is broadly satisfactory, but his sketch-map leaves the work of precise delimitation still to be done. Dr. C. Fenner made the next contribution, in a paper on "The Natural Regions of South Australia" (*Rept. Australian and New Zealand Assoc. Adv. Sci.*, 20, Brisbane [1930] 1931: 509–545), which, supplemented by illustrations of types of landscape, was reprinted in his book 'South Australia' (Melbourne and Sydney, [1931]). Fenner's work is by far the most searching, and shows clearly the principles involved. The first subdivision is climatic; the second is "physiographic" where relief is pronounced, hydrological and botanical where it is not; and the third rests on principles like those of Passarge's 'Landschaftskunde' and of the 'Naturkomplexe' of the East Baltic geographers. Fenner's "natural" regions are parts of "physiographic" (geomorphological) units, which, in turn, are parts of climatic provinces. His climatic boundary continues, though it is not specifically distinguished, on Clarke's map of Western Australia. This boundary between climatic regions, now established in South and Western Australia, was foreshadowed in Taylor's earlier work. It is enough to show that the regional scheme, when complete, will be in accord with the marked zonal relationships already revealed in Australian geography by less particularized schemes (*cf.* "Natural Divisions of Australia," *Geogr. J.*, vol. 85 [1935] 301–302). A further contribution has now come to hand, from Victoria. In an 'Outline of the Physiography and Geology of Victoria' edited by Professor E. W. Skeats and reprinted from a 'Handbook for Victoria' prepared for the 22nd Meeting of the Australian and New Zealand Association (Melbourne 1935), Dr. E. S. Hills has an article on "Physiography," in which he divides Victoria into five "physiographic" regions, three of which he subdivides, but on the same principle. His work is a correction and extension, rather than a revision, of Gregory's work, and manifests the Victorian desire, expressed at Adelaide in 1924, for unmistakable boundaries. His text nevertheless implies his desire to be reconciled with Fenner. His subordinate "physiographic" boundary, by no means purely physiographic, between the Wimmera and the Mallee, corresponds to Fenner's subordinate boundary between the "Murray Mallee" and the "Ninety Mile" regions of South Australia. His boundary between the "Murray Basin Plains" and the "Eastern Highlands" agrees, too, with a boundary in New South Wales, roughly indicated on Taylor's sketch-map. These four papers show that Australian regional geography is proceeding, as advised by the defunct Committee

on Natural Regions, with deliberate avoidance of haste, and with accordant results. The map of regions of Fenner's second order of magnitude now covers three adjoining states and extends into a fourth. It is interesting to note that the average size of these "physiographic" regions is about that of American states. The validity of the subdivision is expressed by its clarification of the meanings of regional names that have long been in popular use in southern Australia. M. A.

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that year, the King of the Netherlands signified his acceptance of the sovereignty of the Belgic Provinces. Accordingly, on August 13, a convention was signed by Great Britain and the Netherlands, under which the former engaged to restore the Dutch colonies "with the exception of the Cape of Good Hope and the Settlements of Demarara, Essequibo, and Berbice, of which possessions the High Contracting Parties reserve to themselves the right to dispose by a Supplementary Convention." The "First Additional Article" attached to this Convention declared that "in order the better to provide for the Defence and incorporation of the Belgic Provinces with Holland" and to provide compensation for the King of Sweden, which Holland was "liable to furnish," His Britannic Majesty engaged to defray the following charges: (1) The payment of £1,000,000 to Sweden. (2) "The advance of £2,000,000 sterling to be applied, in concert with the Prince Sovereign of the Netherlands, and in aid of an equal sum, to be furnished by him, towards augmenting the defences of the Low Countries." (3) "To bear, equally with Holland, such further charges . . . towards the final and satisfactory settlement of the Low Countries, in union with Holland, and under the dominion of the House of Orange, not exceeding in the whole the sum of £3,000,000 to be defrayed by Great Britain." "In consideration and in satisfaction of the above engagements" the Netherlands agreed to cede in full sovereignty the Cape and the Guiana settlements. The third item refers apparently to a "Russian loan made in Holland," for by a further Convention the Netherlands agreed to bear a portion of this loan to the amount of 25 million florins, and Great Britain undertook to bear a similar proportion.

If the Convention of August 13, 1814, is viewed in its correct historical perspective, there can be no question of a "sale" of the Cape by the Netherlands to Great Britain. The Netherlands were not in a position to resist a settlement, some details of which they resented: the inclusion of the payments detailed above in the Convention by which Great Britain acquired sovereignty over the Cape was occasioned, in Lord Castlereagh's words, by "the necessity of having something to hold forth to the public," *i.e.* to justify this expenditure.

NOMENCLATURE IN THE PLOMO VALLEY REGION OF ARGENTINA: CORRECTION

The Editor is indebted to Mr. K. A. Goudge for pointing out that the Editorial Note in the November *Journal*, p. 443, is seriously incorrect: there is no such discrepancy as that alleged by Mr. Blencowe, and the Editor's supposition that Dr. Helbling might have revised the nomenclature is wrong. With his 'Beiträge zur Topographischen Erschliessung der Cordilleras de los Andes zwischen Aconcagua und Tupungato' Dr. Helbling published in 1919 two sheets of the Plomo Valley on the scale of 1 : 25,000. From the northern of these two sheets was made the map on the scale of 1 : 35,000 which was published by Dr. Federico Reichert in 1929 in his work 'La Exploración de la Alta Cordillera de Mendoza.' The three maps which were published in the résumé of Dr. Helbling's report summarised by Mr. Goudge in the *Journal* for January last, pp. 42, 44, and 46, were from tracings which bore no graticule and few names. The pattern of the topography around the Nevado glacier, which comes at the top of Dr. Helbling's southern sheet, is curiously like that about the Ventisquero grande del Juncal (called Juncal No. 1 by Reichert) which is at the bottom of Helbling's northern sheet. Reichert's map, from Helbling's northern sheet, does not go far enough south to include the Nevado glacier. It would seem that the similarity misled Mr. Blencowe, and that the Editor did not pay sufficient attention to the problem to discover the error. For this he begs leave to express his regret to all concerned.

OBITUARY

MAJOR-GENERAL A. W. GREELY, U.S.A.

Very long life is rarely the reward of Polar explorers, and the death of General Greely on October 20 in his ninety-second year recalls events which thrilled the world half a century ago.

Adolphus Washington Greely was born at Newburyport, Massachusetts, on 29 March 1844. He joined the volunteer army of the United States at the age of seventeen and fought all through the Civil War, rising from the ranks to be Captain and Brevet-Major. He was one of the very small number of volunteers admitted into the regular army at the end of the War, beginning again with the rank of Lieutenant and an appointment in the Signal Service for which his scientific tastes fitted him. The Signal Service had to do with the laying out of telegraph lines in the territories and the Weather Bureau was an increasingly important branch of its work.

When the United States joined the International Polar Research scheme Lieutenant Greely was appointed to command the most northerly station for meteorological and magnetic observations during the first Polar Year 1881–82.

He was landed with a party of twenty-four officers and men of the United States Army at Lady Franklin Bay, Grinnell Land, in 81° 44′ N. to carry out the prescribed observations at the base and to extend the exploration of the Smith Sound region as far as possible to the west and north. Careful plans were made to re-provision the party in 1882 and to bring it home in 1883.

Greely built Fort Conger in the bay where H.M.S. *Discovery* of Sir George Nares's Expedition had wintered in 1874–75, and here the prescribed observations were duly carried out. One exploring party under Lockwood reached the highest northerly latitude so far attained, 83° 24′ N., a few miles beyond A. H. Markham's record. Other parties explored the interior of Ellesmere Island, discovering Lake Hazen and the United States Mountains and reaching the west coast at Greely Fjord. The relief ship in 1882 failed to reach Fort Conger and that of 1883 was lost in the ice; so according to plan Greely left the station on 9 August 1883 to proceed southward by boat with all his men in good condition. Ice soon compelled the party to abandon the boat, and on October 15 they reached land on Bedford Pim Island with 40 days' provisions and 250 days before help could be expected. Shelters of a kind were improvised and the scientific observations kept up during a winter of appalling hardships. Men died of starvation "and if Greely gave to the maimed Ellison double food while it lasted, he did not hesitate to order in writing the execution of a man serving under an assumed name of Henry who repeatedly stole sealskin thongs, the only remaining food" (Greely's 'Handbook of Polar Discoveries,' 4th ed., p. 239). When a relief ship found them on 22 June 1884 there were only seven survivors, Greely himself unable to raise his head and capable only of murmuring "Here we are—dying like men." Rescue was just in time, and when Greely visited this country a year later, just fifty years ago, he was still a very sick man and quite unable to speak of the events of that terrible winter.

The Founder's Medal of the Royal Geographical Society was awarded to him in 1886.

As he returned to health Greely gradually resumed his official duties, becoming Chief Signal Officer with the rank of Brigadier-General in 1887. He carried out various important commissions for his Government in the Philippine Islands and elsewhere, and he was the first to bring wireless telegraphy into use as a link

in the ordinary telegraphic service to Alaska. He represented the United States Army at the coronation of King George V in 1910.

Greely had a wide reputation as an authority on Arctic exploration, and was a regular attendant at international scientific gatherings, dispensing generous hospitality at his house in Washington to the delegates attending at the meeting of the International Geographical Congress in 1904. He published a valuable 'Handbook of Arctic Discovery' in 1895 to which additions were made in three subsequent editions, the last two under the title of 'Handbook of Polar Discoveries.' As a concise, accurate and impartial summary of geographical exploration in the North Polar area this book remains unsurpassed.

His other writings include 'Three Years of Arctic Service,' 1884; 'American Weather,' 1888; 'Handbook of Alaska,' 1925; 'Reminiscences of Travel and Adventure,' 1927; and 'The Polar Regions in the Twentieth Century,' 1928.

H. R. M.

CORRESPONDENCE

THE DESERT FAYUM

It has been suggested that a reply to J. B.'s review of 'The Desert Fayum' in the *Geographical Journal* of August might be of general interest, and the following comments are submitted, in the hope of clarifying the points at issue, if not of re-solving them.

'The Desert Fayum' is mainly an archaeological record; about one-tenth part only is physiographical, and summarizes evidence given elsewhere in specialist publications. This one-tenth, concerning the history of the Fayum Lake from palaeolithic to late historic times, is epitomized in a graph, 17 cm. long, on Pl. cvii, 3. J. B. concentrates his review upon the historic fraction only, represented in the final 2 cm. of that graph, and omits all reference to the 15 cm. depicting our views on the very important prehistory of the lake, formerly unknown. The tail seems to require the dog.

Though accepting concrete evidence that the lake lay somewhat below sea-level in the third millenium B.C. (Old Kingdom times), J. B. rejects the conclusion that it never rose again above that level, and he reverts to the old theory of a huge artificial lake, Lake Moeris, which endured from the Twelfth Dynasty to early Ptolemaic times, *i.e.* something over 1500 years, sinking in the third century B.C. only to below sea-level.[1] This lake he suggests might possibly have reached to more than 20 metres above sea-level, consequently submerging neolithic and early historic sites at lower levels, discovered and excavated by us. It is remarked that we have failed to prove their non-submergence. It is hard to prove a negative.

When our Fayum work began, the historic date of the 22-metre level, long accepted, was unquestioned by us. Our discovery that in reality it was of Pleistocene age, and but a stage in the contraction of that lake from a much higher level previously unsuspected, forced us slowly, and combined with other evidence, to abandon the easy orthodox view. The statement that this 22-metre level is of palaeolithic age has, incidentally, been advanced also on independent evidence by Drs. Sandford and Arkell.[2] Unless therefore J. B. rejects this com-

[1] At present it lies over 44 metres below.

[2] 'Paleolithic Man and the Nile–Faiyum Divide,' pp. 58–61, 73.

bined diagnosis he must postulate two lakes, separated by many millenia, which reached approximately similar levels. On this view the physical deposits of the Pleistocene lake have survived; those of the recent historic one have vanished so completely that neither we nor those geologists who followed after us have, in nearly continuous work between 1924 and 1934, been able to find them.

It is true the historic lake would have but about 1500 years in which to register its presence, and erosion may have scoured away the bulk of its deposits since 300 B.C. But we find it hard to believe that recognizable traces would not lurk still in sheltered spots, particularly searched.

There are other difficulties, perhaps not realized by J. B., who has not, we believe, studied the region, which stand in the way of our ready acceptance of the hypothesis (it is really no more) of a recent high-level lake. For those who have not read 'The Desert Fayum' and other publications, we may re-summarize the evidence—necessarily negative—on which we relied, and must continue to rely, until J. B. or others furnish objective counter-evidence *in the field* for the following points:

(1) Absence of historic high-level deposits overlying or banked against the earlier one ; absence of beaches, storm beaches or wave-cut platforms, which being of such recent origin could not, we think, have disappeared entirely.

(2) Absence of molluscan fauna of historic date above sea-level. Those who have read E. W. Gardner's monograph, 'Some Lacustrine Mollusca from the Faiyum Depression,' [1] will remember the striking distinction shown between the Pleistocene shell assemblage with its palaearctic elements and specialized forms, confined exclusively to this oldest lake, and that of the lower, later, neolithic and early historic lake, with its more normal African or Nilotic facies. Had a historic lake regained its Pleistocene level, a "recent" fauna, differentiated from the Pleistocene, and in a condition even fresher than that of the neolithic, would we believe undoubtedly betray its presence. If Lake Moeris existed it had a fauna. Where is that fauna?

(3) Absence of fresh shore-line vegetation at supposed Moeris level. Both palaeolithic and early neolithic vegetation occurs in well-defined shore-line zones and is completely calcified. The vegetation of the late neolithic–early historic shore-line at about 2 metres below sea-level, on the contrary, is unmineralized and relatively fresh. A recent high-level lake may reasonably be expected to have left a belt of water plants whose condition should be even fresher than those of the third millenium. That belt has not been found.

These then are some of the main physiographical objections to our willing acceptance of the Moeris hypothesis. The reviewer makes no reference to them, but brings, on the other hand, certain of our archaeological observations to bear in favour of his views; and he is prepared ruthlessly to drown, deep beneath the waters of Moeris, such of our neolithic or historic sites as venture to place themselves at lower levels. When, nearly fifty years ago, the Moeris hypothesis was first launched, the existence of such sites was of course unknown. Until we found it, the mere possibility of an Old Kingdom site at sea-level would have been laughed out of court.

Now the physical effect of very prolonged submergence on various substances is incompletely known. Nile Valley sites or tombs below modern high Nile level provide however some evidence with which field archaeologists are familiar. It would I think be difficult to prove on purely archaeological grounds the non-submergence of the Fayum neolithic sites, as their contents—pottery, bone, shell, and stone articles—would probably not deteriorate in still water. I should

[1] Institut d'Égypte, 1932.

however expect nodules of soft red ochre, used in neolithic pottery making, to dissolve and stain shell scoops with which they lay in contact at a level of 16 metres above sea.[1]

The submergence, without trace, of historic sites containing metal is however a still greater difficulty. The reviewer, to explain their bad condition, suggests submergence of the lower neolithic granaries at about 25 metres.[2] That being so an Old Kingdom village at 21–22 metres, and a Middle Kingdom cemetery at 24 metres, were also submerged,[3] and these contain copper objects whose freedom from corrosion is hardly compatible with prolonged submergence.[4] It may be questioned also if the bad condition of the lower neolithic granaries is evidence of lake action, for drainage from the higher ridge behind seems a simpler explanation, coupled with the gypsum-impregnated ground. Nor is it easy to believe that mud and dung plaster on the silo walls would survive centuries of water action.

Turning lastly to Ptolemaic questions, J. B., using our numismatic and irrigation level evidence, suggests that Moeris lay at about 2 metres below sea-level in the second half of Ptolemy Philadelphus' reign (285–246 B.C.). He states that no Ptolemaic town is mapped below sea-level. Here he relies on obsolete information. Surface contours are dangerous to use in an archaeological argument, for the earliest occupation levels may lie many metres below the surface.

Thus at Karanis, though the surface contour is shown at sea-level, the earliest, Ptolemaic, settlement lies at 11 metres below it,[5] and this, on papyrus evidence, may, according to expert opinion, "safely be said to date back before the middle of the third century B.C." [6] Since the adjacent irrigation we describe is dated by coins to the same period, it seems straining the evidence severely to suppose that Karanis was founded later than the development of the neighbouring agricultural land, some 10,000 acres in extent, which, as we have shown, was watered by the 16 miles of channels we discovered. That being so, we doubt if J. B.'s proposal to feed the irrigation system by water from lake infiltration at 2 metres below sea-level is feasible. We are not irrigation experts, and J. B.'s opinion may be weighty. Nevertheless the channels and "reservoir" were seen by senior officers of the Irrigation Department on several occasions, and none, I believe, questioned their connection with the great Bahr Wardan canal as the feeder. It may be noted, apropos the "reservoir" which J. B. cannot accept as such, that the Karanis excavations have disclosed a closely comparable structure of similar depth which is referred to as a "cistern." [7] Whatever its purpose, it remained in use until the late second, early third century A.D. J. B. can hardly postulate, in view of its date, that it also was a sakia pit.

In regard to Tell-er-Rusas, near present lake-level, our dating is admittedly of slight value. A Graeco-Roman specialist on the Michigan staff judged sherds from it to be pre-Roman. The Ptolemaic dynasty lasted from 323 to 30 B.C. and

[1] 'Report on Neolithic Pottery and Bone Implements from the Northern Fayum Desert,' Man. October 1925, p. 154, Fig. 2. See also 'The Desert Fayum,' p. 84, Sect. 124.

[2] An obscurity in the text ('The Desert Fayum,' p. 52, Sect. 77) misled the reviewer to take 23 metres as the height of these. A spot height of 85 feet above sea-level (*i.e.* 25·90 metres) is given for the site on the maps, Plates cix–cxiv.

[3] I take the surface levels. The graves were sunk in some cases 1½ metres lower.

[4] A knife blade in Manchester Museum is perhaps the best example (*cf.* 'Desert Fayum,' p. 100, Sect. 149).

[5] 'University of Michigan Studies,' XXV., p. 3.

[6] Quoted from a private letter.

[7] 'University of Michigan Studies,' XXX, p. 25, Pl. IV, 8, and plan VIII.

I envisaged a late date for this site. Even this however may be rash, and I should not hesitate to accept a Roman date on better evidence. It affects however neither J. B.'s conclusions nor ours either way, since the point at issue is the lake level in *early* Ptolemaic times. We have always refrained from venturing a view as to the exact position of the lake in Ptolemy Philadelphus' reign, though we claim to have been the first to prove that it lay somewhere under 5 metres below sea-level. The difficulty of dating Graeco-Roman sites by pottery alone drew from me the remark "Until more exact ceramic dating of Ptolemaic and Roman sites is rendered possible by intensive work such as that of the University of Michigan, it is waste of time to attempt to follow the vicissitudes of low lake-levels within that period, since settlements and cemeteries, as we discovered on Gesiret-el-Qarn, may be found less than 65 feet above present water level." [1]

We can give the assurance that future work will be, and has been since 1930, recorded in metres. Our use of feet in the Fayum work, adopted also by other expeditions there without incurring censure, was dictated by the fact that we worked on behalf of the British School of Archaeology, which for forty years has used only this measurement. In fairness we also beg the reviewer to note that sea-level datum is given throughout the publication, except in the case of certain maps re-utilized from earlier publications, to save expense.

G. CATON THOMPSON.

MEETINGS: SESSION 1935–36

First Evening Meeting, 4 November 1935. The President in the Chair

Paper: The Himalaya as a barrier to modern communications. By Professor Kenneth Mason (The Sixth Asia Lecture)

First Afternoon Meeting, 11 November 1935. The President in the Chair

Paper: The Physiographic History of the Yangtze. By Professor G. Barbour

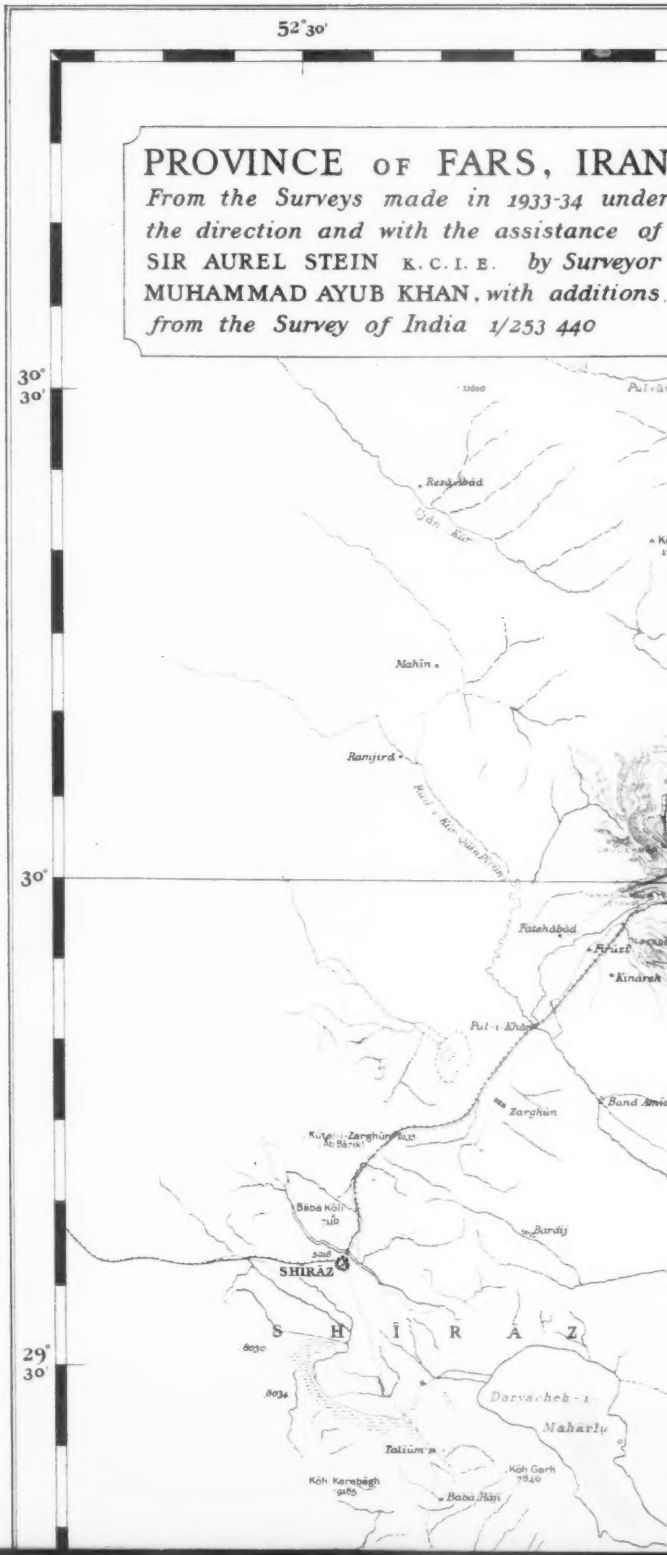
Second Evening Meeting, 18 November 1935. The President in the Chair

Elections: John Richard Ainsworth, B.A.; Dr. Robert Ambrose, B.A.; Donald Bagley, F.C.S.; Mrs. Olivia Barber; Mrs. May Grace Beadnell; Miss Doris Edith Beasley; Joseph Alric Beauchemin; Wilfrid Carruthers Bell; Jocelyn Bodilly; Hugh Frank Pakenham Borthwick; Charles Ogilvie Will Bowman; James William John Brown; Leslie V. Bryant; Allston Burr; Sydney Butler; The Hon. Anthony Charles Freskyn Hamby Chaplin; O. H. Chapman, B.A.; Her Excellency the Donna Beatrice Colonna; The Reverend Walter Wilmore Cotton; Harold Douglas Creedy; Timothy Talabi Dada; Paul Damour; Thomas Arthur Warren Davis; Frank William Dutton; Miss Henrietta I. Dyson; Herbert Sauzier Elton, M.C.; Captain Roy Gordon Everest; Major Max C. Fleischmann; Kaikobad Adarjee Gai; Naldrett Gibson, B.SC.; Frederick Goertz; J. A. Gunn, M.B.E.; Waldo Harnack, B.SC.; S. Harrington; Arthur Glyndwr Harris, M.A.; Tegwyn John Harris, M.A.; His Highness Prince Mahomed Hassan; Deryck Victor Hitchman; Miss Elizabeth Mary Hodgson; Lady Hosie; Felix Howland; Charles Hunt, M.D.; Lieut. Henry Cecil John Hunt; Miss Pamela V. J. Hutcheson; Rustom Ardeshir Irani; Mrs. Sushila Devi Johri, B.A.; Ardeshir Sorabji Kalapesi, B.A., B.SC., PH.D., F.G.S.; T. B. Kankan, M.A.; Gordon W. Land; John Barker Leaver; Miss Elizabeth Wharton Le Marchand, M.A.; Mrs. Margaretta

[1] 'The Desert Fayum,' p. 156, Sect. 245.

Louisa Lemon; John Lewisohn; Horace Robert Light, B.SC.; Edmond Wilfred Scofield Linton; Sidney Long; Mrs. Harriett Maclaren; Thomas Alexander Stuart-Menteath; Mrs. Helen A. Milford; The Reverend Edward Morgan; Mrs. Dorothy Anne Mowll; Mrs. Gytha Eastman-Nagle; Mrs. Glyn Nicholas; George Leonard Jack Oliver; Captain T. A. Hacket-Pain; Thomas Henry Louis Parker; Ronald Francis Peel; Captain George C. Pereira; C. E. Pritchard, B.SC.; John F. Rowan; James Edward Roy; B. Shenburg, B.SC., A.M.I.C.E.; Gordon Sinclair; F. C. Goulding Smith; Sydney Wilfrid Smith; H. W. Stallworthy; Brian Arthur Lewis de Vere Stuart; Samuel Sykes; Eric H. Taylor; Ingle Few Ernest Thoday, B.A.; Arthur Landsborough Thomson, C.B., O.B.E., D.S.C.; Mrs. Diana Sutton Vane; C. W. Ward, M.A.; Martin Ware; Charles B. Warren, M.R.C.P.; David Earp Watts, B.A.; David Anthony Wehl; Andrew Whyte; David William Wood, M.B.E.; Laurence Wood; Meredith Worth

Paper: The Oxford University Ellesmere Land Expedition 1934. By Dr. Noel Humphreys and Members of the Expedition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From the Surveys made in 1933-34 under
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SIR AUREL STEIN K.C.I.E. by Surveyor
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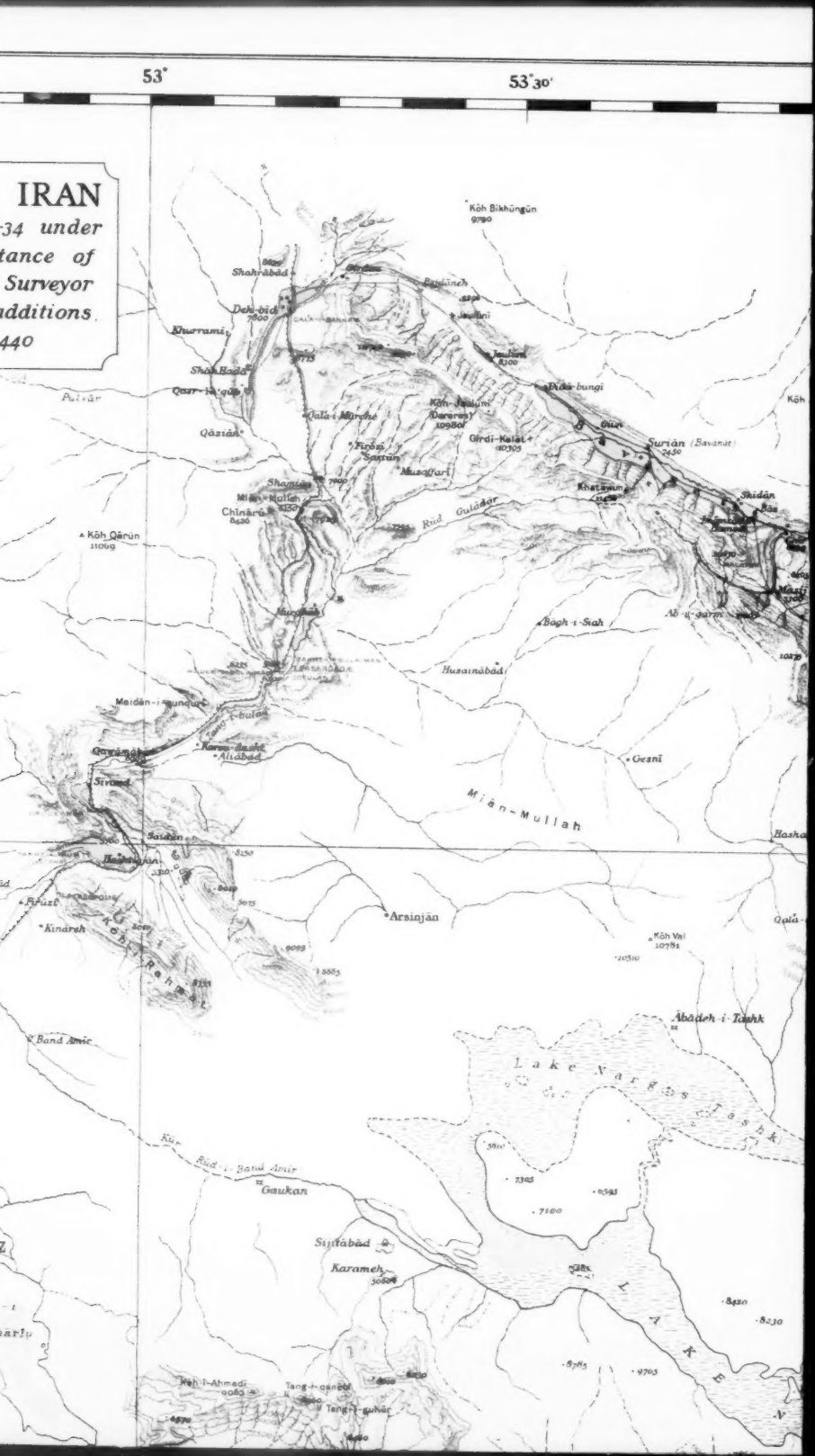
Baba Hani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Kūh-Jaulāni
(Dareres)
10980
Girdi-Kalāt
Firūz
Sastūn
Musaffari
Shamsīān
Mīān-Mullah
Chinārū
8436
Kūh Qārūn
11069
Rūd Gulādār
Turiān (Bavānat)
2430
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Saidān
Bāgh-i-Siah
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Maidān-i-qunqurc
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Karez-Sachk
Alīābād
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Mīān-Mullah
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Arsinjān
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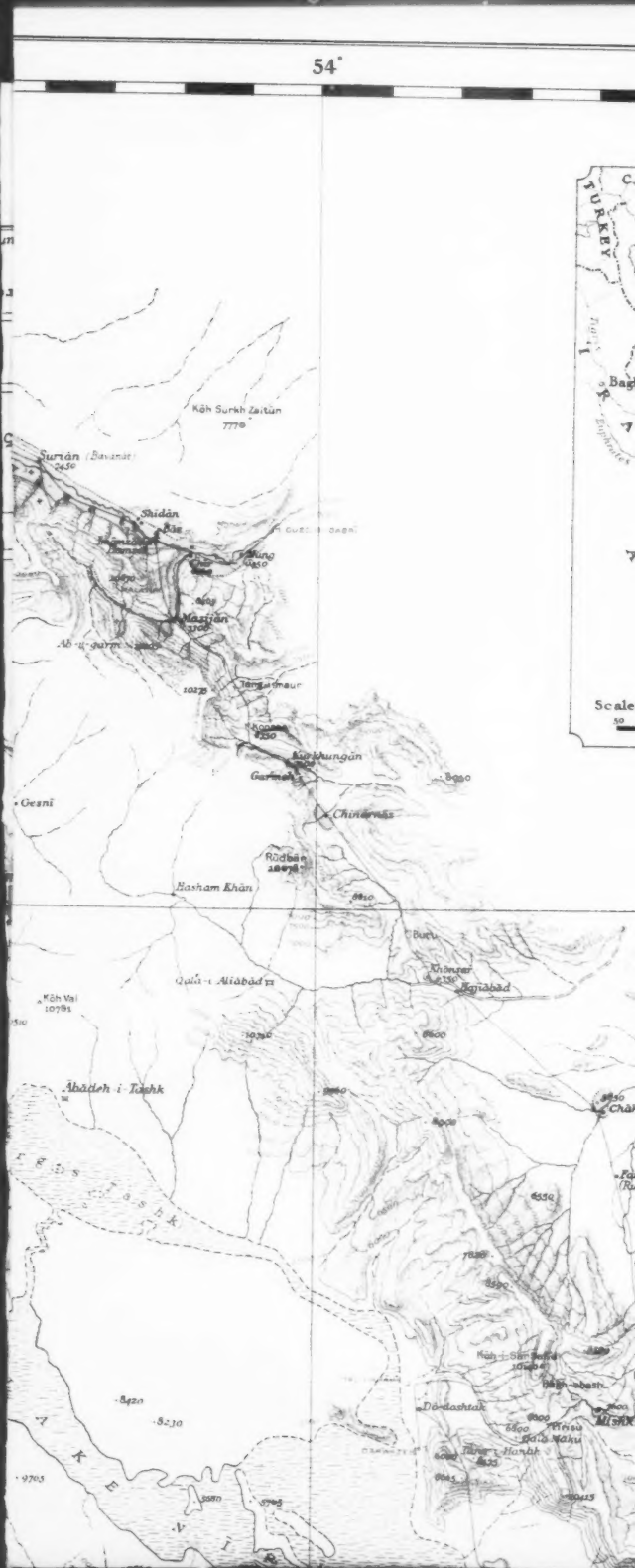
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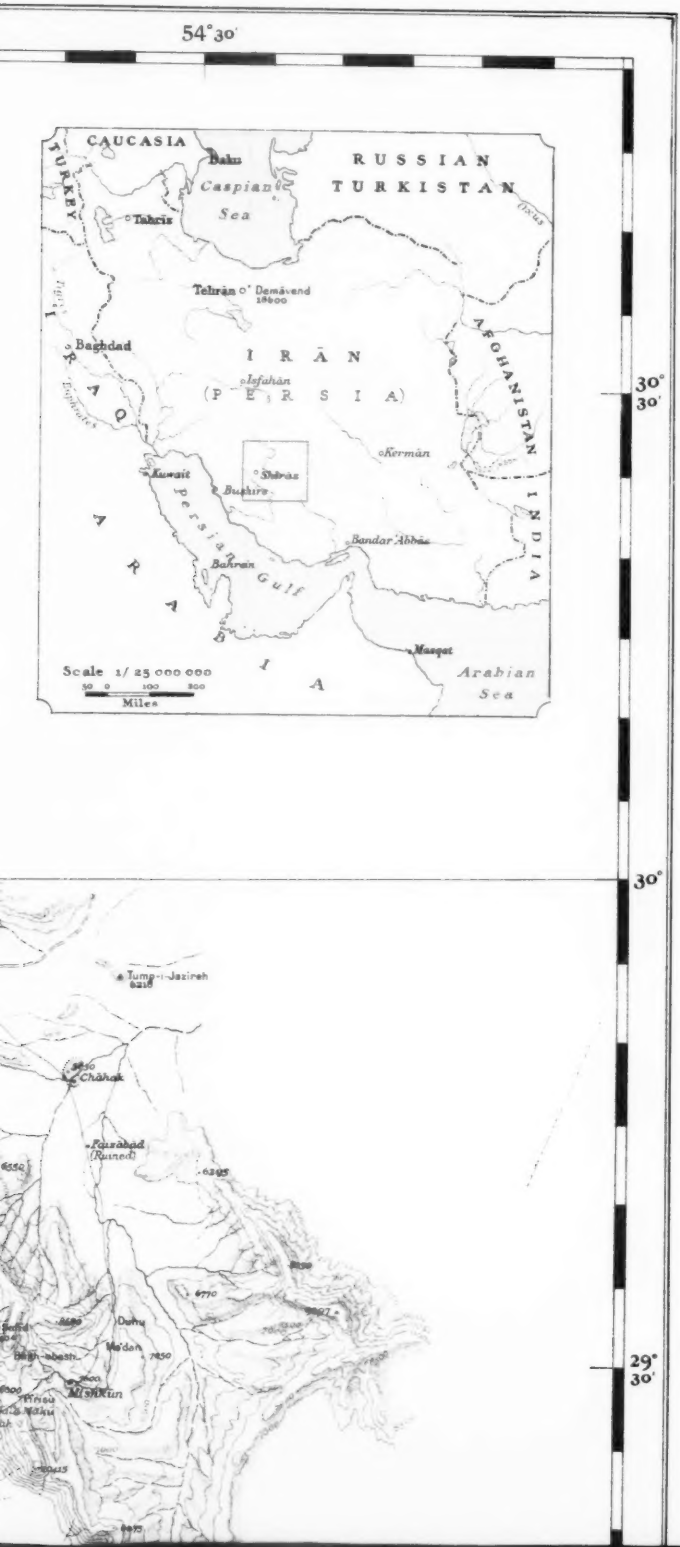
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Kermán
AFGHANISTAN
INDIA
Kuwait
Shīrāz
Bushire
Persian Gulf
Bandar Abbās
Bahrain
Masqat
Arabian Sea
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29°
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52° 30'
Fatehabad
Kohak
Ibrahimabad
Deh-gilaki
Kamalabad
Chahar-taq
Arobs
Khawis
Babanach
Rivers: perennial
non-perenn
Spring
Well
Underground Ca
Salt marsh
Cistern
Routes: surveyed
unsurveyed
Ancient site
Circumvallation
Burn
Muhammadan shrine
Muhammadan
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Akbarabad
Kamar
Nauruzan
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Gardaneh Tang-i-Ahahi 6505
Gardaneh Gir-i-Bahman 7000
Köh-i-Sefid 9373
Baba Haji
Köh Garh 7840
Safidar
Köh-i-Pidun
Chah-i-Zangibar
Kaha-ye-Kabud
Kara aghach (Mand) R.
Sarvistan
Daulatabad
Sadarabad
Tang-i-gaseb
Tang-i-gulwar
Koh-i-Ahmadi
Zuh-i-Chinar
Gardaneh-i-dasta
Nasserabad
Bakshuri
Kuh-i-Kharmala
Tang-i-Karam
Shahristan
Khaneh Kehdan
Gardaneh-i-shedid
Shahr-Bekr
Balá-shahr
Kuhdasht
Kuhdasht-i-sufla
Köh-i-Safidar
Taduvan
Fattehabad
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Kara aghach (Mand) R.
Fasá
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Takhta-sang
Jahrum
Nájiyabad
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Dih-pain
Banjangard
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Shahristan
Khaneh Kehdan
Gardaneh-i-shedid

Khīr
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Qādarābād
Akharabād
Shesh-deh
Dastgird
Mūrdī
Shamsābād
Qilīsān
Ghaznābād
Ghaznābād
Khairābān
Pādiābād
Zāhidān
Mān-deh
Kāzirābād
Koh-i-Gar
Mudarān
Mahūrī
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nal, Dec. 1935

Fortified place ▣ *ruined* ▫ *Watch tower* ▲
Telegraph line ——— *Pass* ⌅ *Village* •
Approximate contours at 500 feet interval
Trigonometrical heights in feet 10499
Barometrical and clinometrical heights in feet 5020 *Limits of cultivation*

Stein: Ancient Persis